The American Journal of Surgery

EDITED BY THURSTON SCOTT WELTON, M.D., F.A.C.S.

April 1941

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Special Monograph

Cancer of the Tonsil

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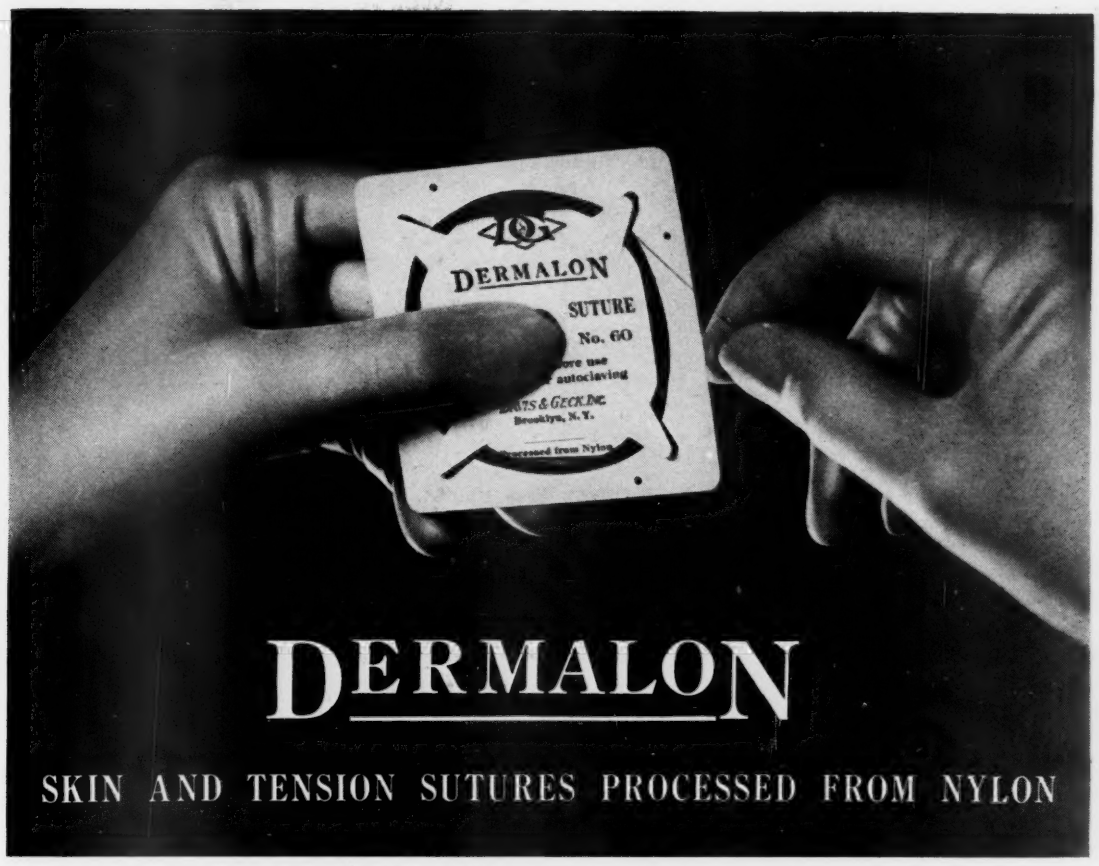

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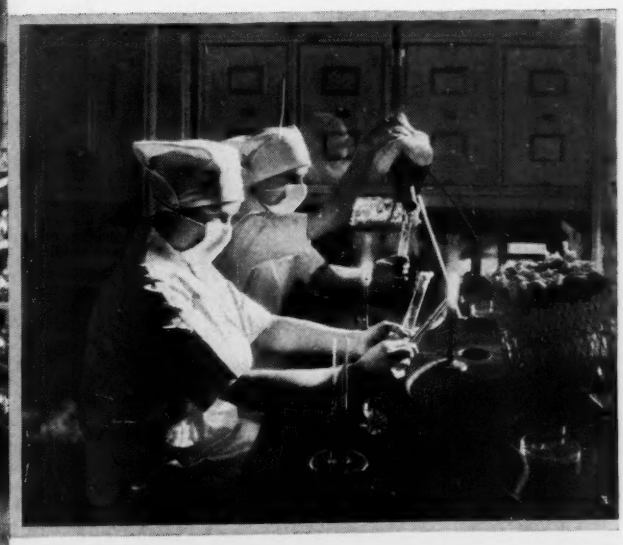

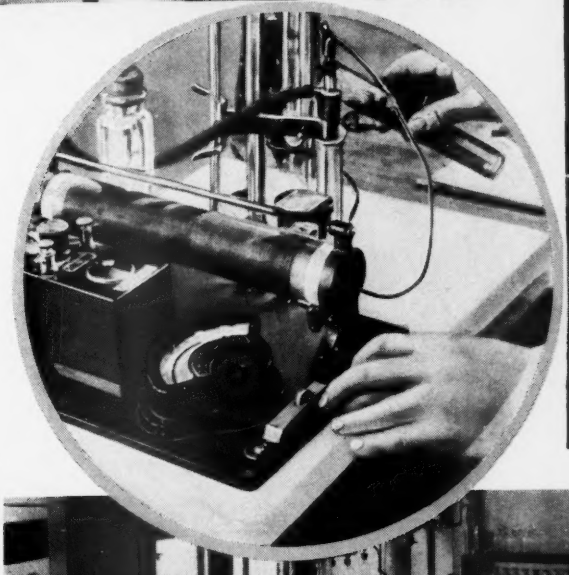

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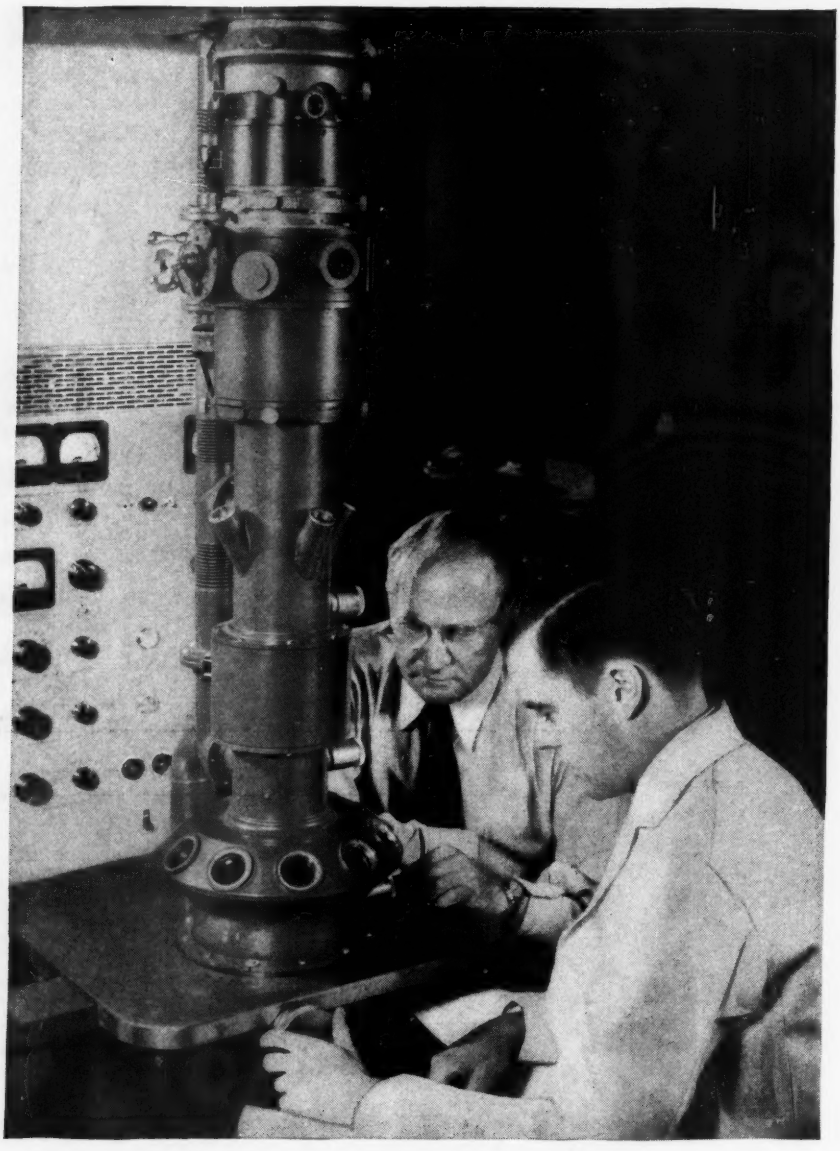

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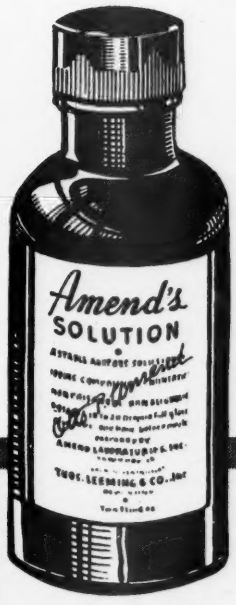

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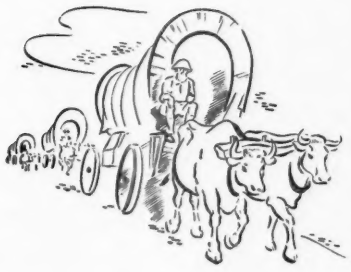

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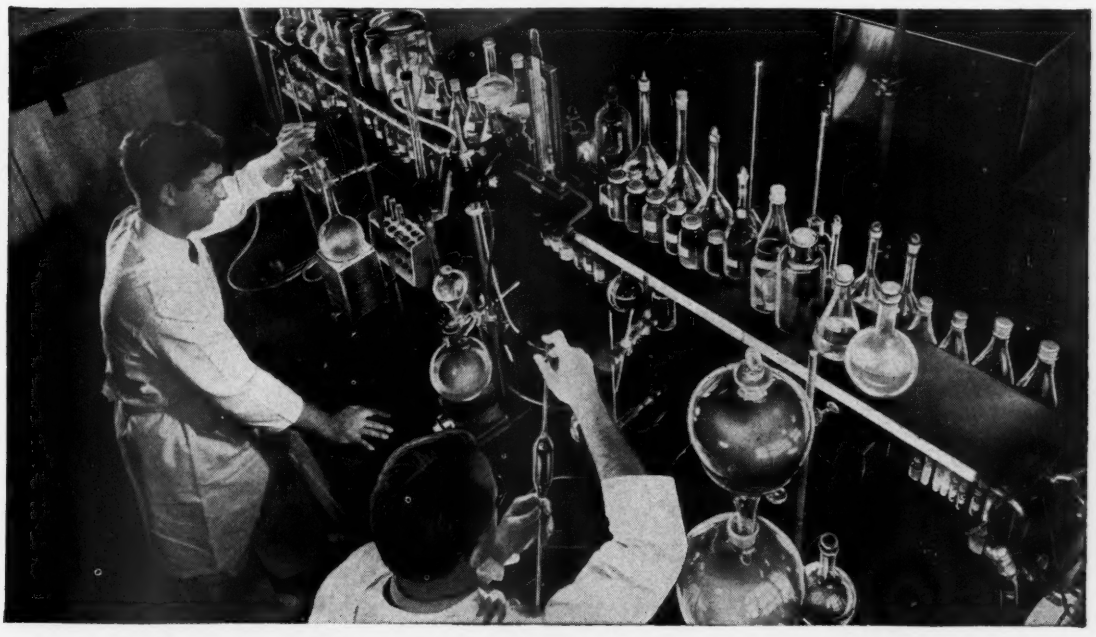

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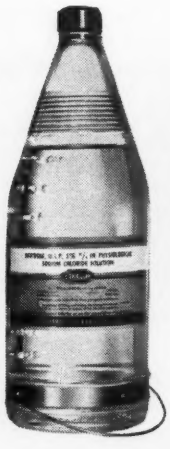

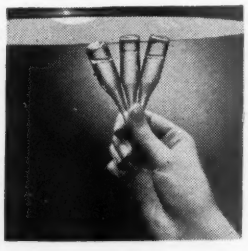

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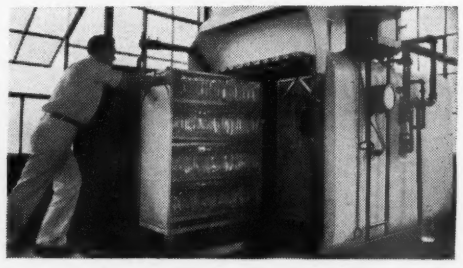

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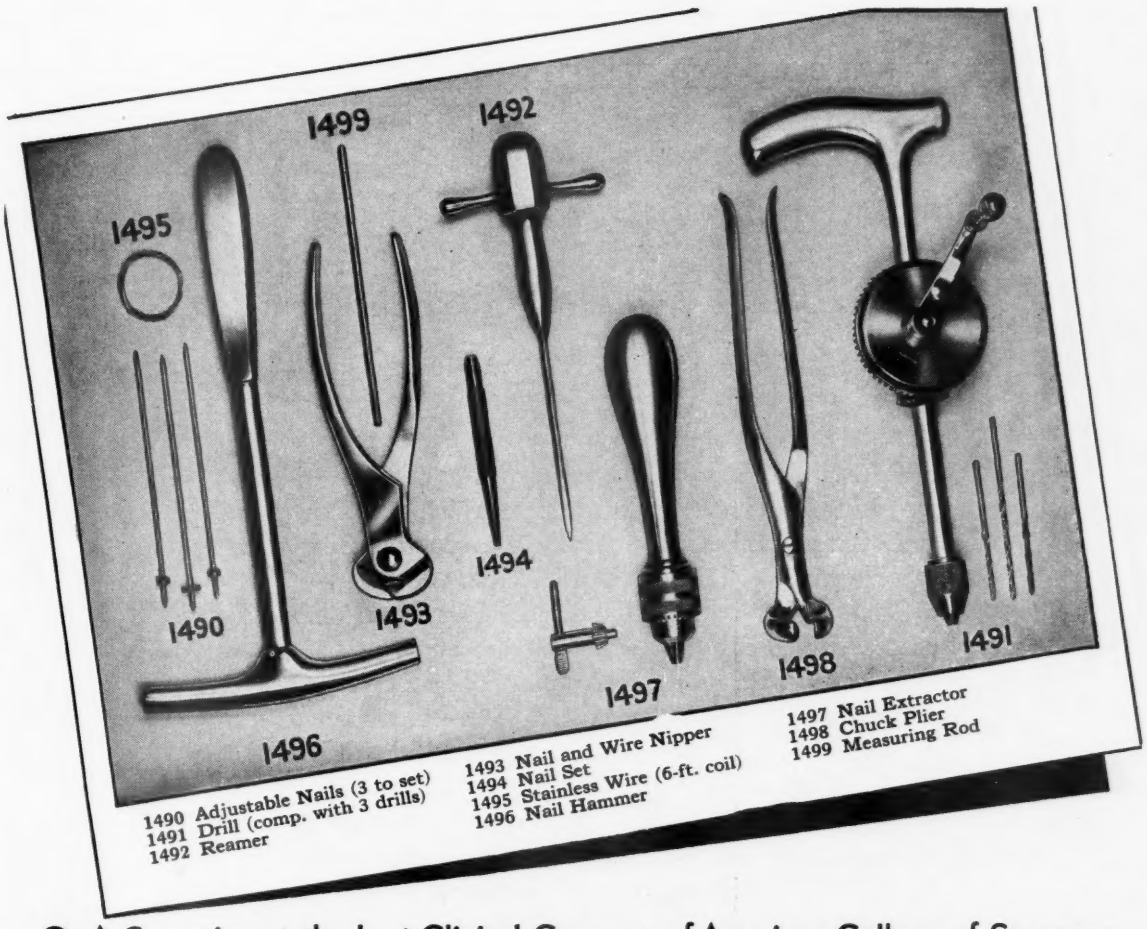

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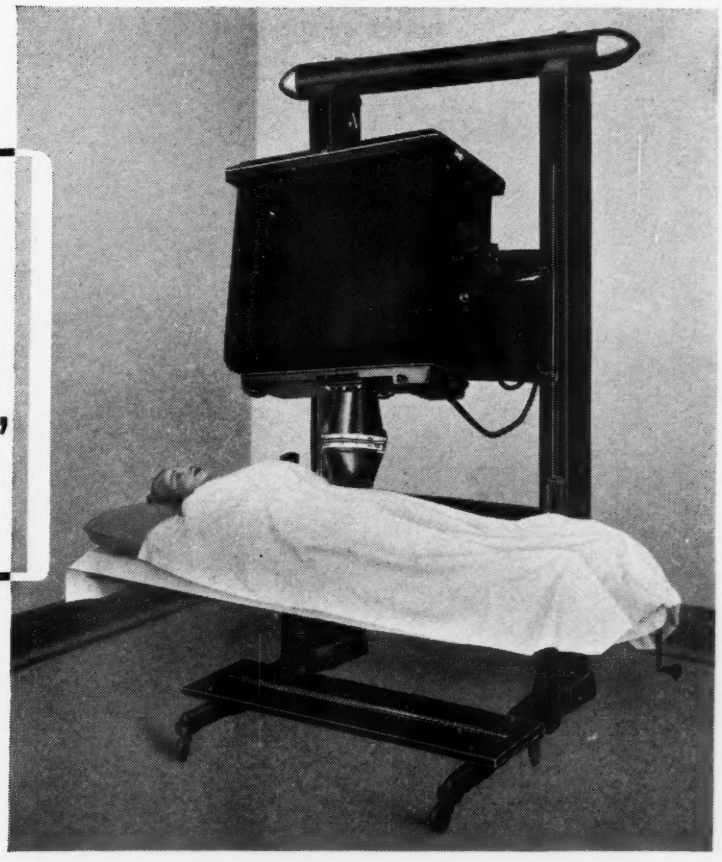

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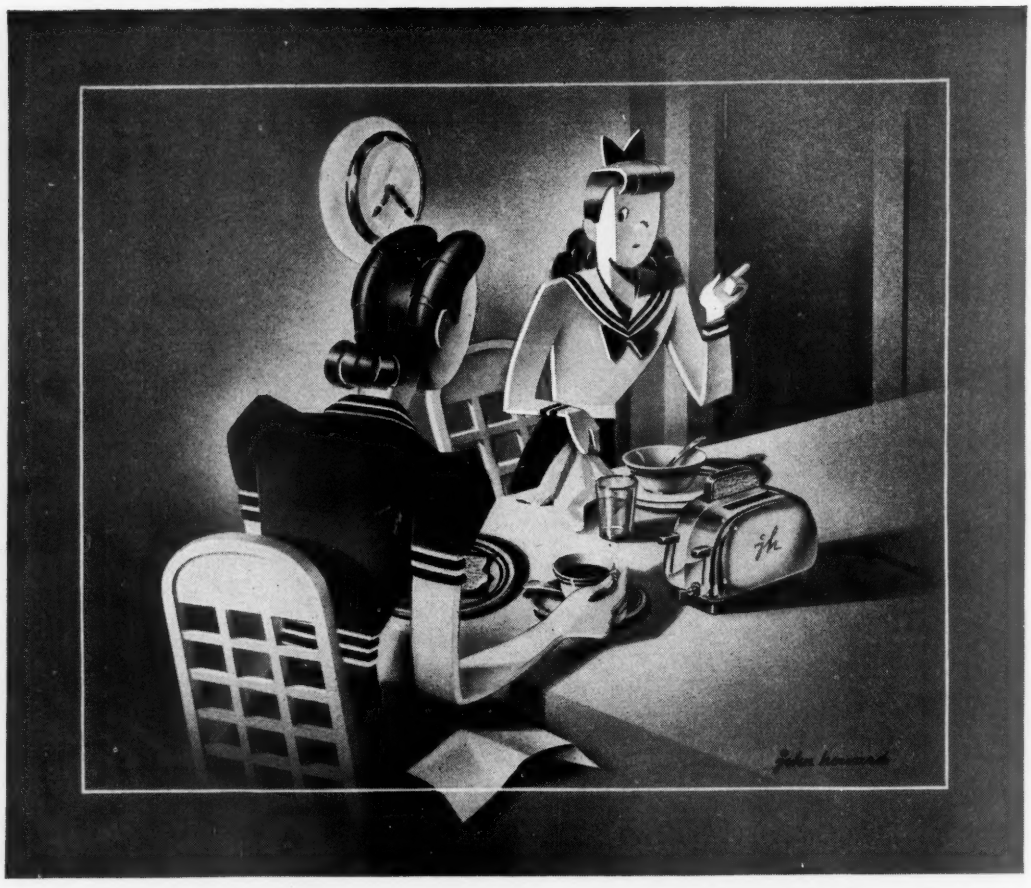

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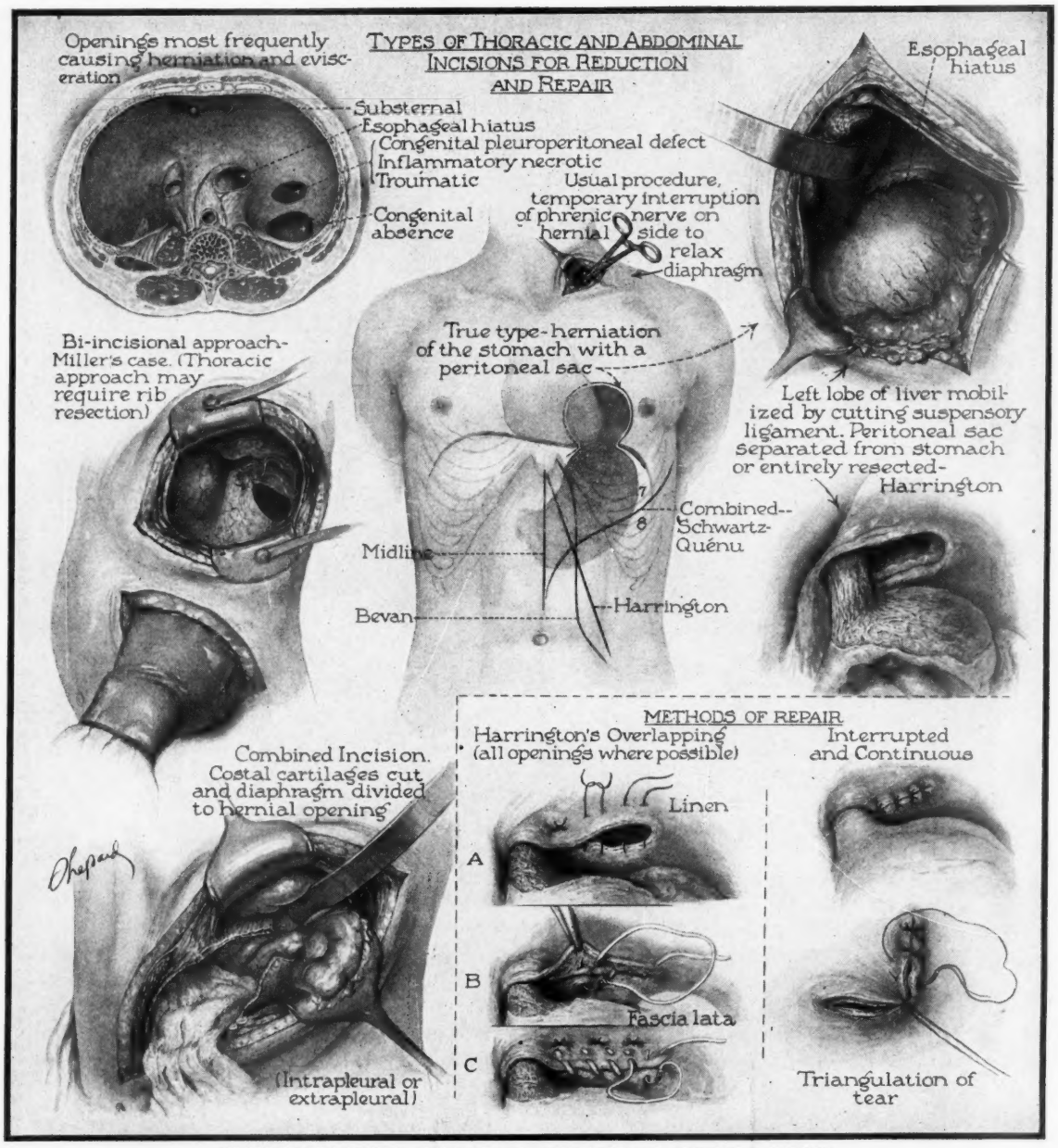
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Editorial

MEDICAL STUDENTS AND MILITARY TRAINING

NEARLY all medical students are between the ages of twenty-one and thirty-five years—the draft age. It was thought when the draft started that medical students would be exempted until they had graduated and had one year of intern training. Then it was discovered that this was for the most part wishful thinking. At the present time if a quota must be filled in a locality, medical students can and will be drafted. This would turn out to be a costly mistake.

No group of men are more anxious to do their bit for their country than the members of the medical profession. In time of war the health of the fighting forces and the civilian population will depend on them. Not only must one look to the present but look also far ahead; for who knows when the present emergency will terminate? A doctor of medicine cannot be made by any known short cut.

To draft medical students would be akin to killing the goose that lays the golden egg. Cut down on the embryo physicians and the day will come when an acute shortage will be felt. This would be calamitous. Every year a percentage of the members of the profession die or retire because of age or infirmities. This loss is met by our medical colleges graduating fresh medicos annually.

Each medical college is geared to take care of a certain number of students. For example, some colleges can handle fifty students in each class, others a hundred. This calls for a certain amount of equipped laboratory space and clinical material for teaching purposes. By a slow process, a teaching staff is assembled—an evolution of years—and that staff is usually sufficient to meet the teaching requirements of the number of students making up the classes of a particular college. Suddenly to cut down or attempt to enlarge present day classes would raise havoc. A great loss in a student body would put a tremendous financial burden on an institution; few places are geared to accept suddenly extra large classes anticipating that the number of students subsequently might be lessened by the draft.

With those, only a few of the problems in mind, the Deans of Medical Colleges have tried to meet the situation. Their aim is to co-operate with the government officials. They want to prepare the way so that any number of trained doctors of medicine can be called if and when needed. In every manner these far-seeing and professionally trained men—the deans—are anxious to keep their schools going efficiently. They also desire to graduate their quota of well trained young men, as well as to regulate the profession so that at all times there will be sufficient professional men for the army and navy, for public health and for the needs of the civilian population.

We are informed that they have been conferring with the proper officials in the Nation's capital.

We hope these government officials will be willing to co-operate with the Deans of our medical schools. We pray all concerned will discover a common formula by which the production of physicians will go on uninterruptedly, and at the same time trained doctors of medicine in sufficient numbers will be available for all the requirements of the country.

Since the foregoing was written the following editorial appeared in the N. Y. World-Telegram on March 17, 1941:

MEDICAL STUDENTS AND THE DRAFT

A bill introduced by Senator Murray of Montana would amend the draft law so that medical and dental students, hospital internes and resident hospital physicians would not be conscripted until they have completed their professional training.

Arguments for it are that these young men will be more useful, whether in military service or in civilian life, if permitted to finish their training now and that the internes and resident doctors are greatly needed in the hospitals, many of which already are understaffed.

The argument against it is that if draft deferment is granted to one class of men it will be demanded for other classes.

If any class has a better blanket claim to deferment than all others we'd say it is the medical and dental students and hospital workers. So we think the Murray bill should at least have thorough consideration by Congress.

One thing is certain: The draft law as it stands, with its insistence that each local draft board shall be free to consider each man's case on its individual merits, is producing many unfair complications. Some local boards, for instance, defer all medical students and internes. Other local boards have different policies. This lack of uniformity runs all through the draft system, the local boards not being required to follow standard rules as to deferment for married men, skilled workers, students or members of any other group.

Action by Congress apparently will be necessary to put more uniformity into the draft system, and that action should come soon.

Such a proposed bill should be given serious consideration. We agree with the writer in concluding, "Action by Congress apparently will be necessary to put more uniformity into the draft system, and that action should come soon."

Medical students are exempt in Canada and Canada is at war. We hope common sense and not hysteria will be the rule in our country.

T. S. W.

Original Articles

THE DIAGNOSIS AND TREATMENT OF ACUTE DISEASES OF THE ABDOMEN IN CHILDREN

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INTRODUCTION

THE acute surgical diseases encountered in childhood differ from the common acute conditions from which adults suffer. Not only do children suffer from different types of ailments, but the same illnesses may not manifest themselves in the same manner as in adults, and the treatment required may vary. For these reasons, the surgeon who deals with young individuals should possess a basic knowledge of pediatrics. Sympathy, tact, patience, firmness and gentleness are primary considerations in the management of the ill child. Too often a hasty, superficial examination is made because the patient is not old enough to make himself understood and is frightened and unco-operative. Attempting to make a diagnosis in children is often a difficult and tedious process. When a history is obtainable, it should be as thorough as possible. Details derived from relatives must be sifted carefully, since in their anxiety for the patient their statements are apt to be misleading. If thoughtfulness and delicacy are employed, a complete, informative examination can usually be made. Keen observation and intelligent reasoning must be utilized while conducting the investigation, for the few signs and symptoms exhibited by the child may be the only evidence upon which a diagnosis can be based. It can readily be seen that close co-operation between the family physician or the pediatrician and the surgeon is essential.

GENERAL CONSIDERATIONS

There are many fundamental differences between acute diseases of the abdomen in children and in adults. These differences are both psychological and physical. Ordinarily no effort is made by the child to obscure the history. The mind of the child is not confused with the fear of a possible operation or the sympathy to be gained by such a procedure. But the nervous system is not as stable in children as in adults and their reactions to psychic stimuli are more marked. While positive statements are essentially truthful, negative statements cannot be relied upon.

Physical signs in children must be elicited with great gentleness and keen judgment is required for their evaluation. It should be remembered that the muscular and fat layers are not so thick and that there are relatively different anatomical relationships. Distention and tenderness are easily recognized but difficulty may be experienced in localizing the latter. Care and patience are required in order to distinguish voluntary resistance and true rigidity. It has been shown that children are less resistant to infection because the peritoneum is not so well vaccinated by autoinfection, lymphatic absorption is more rapid and the omentum is poorly developed.

Experience has demonstrated that a rather definite relationship exists between the age of the child and the acute abdominal lesion from which he is suffering. Persistent vomiting during the first few weeks

of life suggests the presence of congenital hypertrophy of the musculature of the pyloric ring. Intussusception is common in infants between six and twenty-four months of age. Acute appendicitis, one of the most common lesions in persons of all ages, is rare before the age of one year. The greatest incidence of pneumococcic peritonitis seems to be between the fourth and the tenth years. Peculiarly enough the sex of the child also has been found to be of some significance in diagnosis. For example, congenital hypertrophy of the pyloric muscle and intussusception are more common in boys, while pneumococcic peritonitis occurs more frequently in girls.

When a child is apparently suffering from an acute abdominal disease, it is essential to establish whether the pathologic condition is truly abdominal in origin, and if it is, whether prompt surgical intervention is required, or whether the symptoms are referred to the abdomen from some other part of the body. Occasionally, acute tonsillitis is accompanied by abdominal pain as well as by fever and vomiting. These signs and symptoms, when sufficiently prominent, may be disconcerting. In an adult, lobar pneumonia will rarely be mistaken for intra-abdominal disease, but in children differentiation becomes more and more difficult the younger the infant. Diaphragmatic pleurisy is not easy to distinguish from peritoneal irritation, especially in young individuals. While both of the latter conditions give rise to referred abdominal pain and even rigidity, the local tenderness and rigidity associated with peritonitis is usually more marked and definite.

Typical cases of pyelitis are not difficult to differentiate from intra-abdominal disease, but in many instances atypical manifestations are exhibited. These are apt to add to the confusion if the two conditions occur together. Moreover, it is common to encounter patients suffering from acute appendicitis who have revealed all the signs and symptoms of pyelitis. Acute lesions of the spine or hip also may produce evidence suggestive of abdominal disease but usually these conditions can be identified by physical and roentgenologic examinations.

On the other hand, there is a common medical condition, arising in the abdomen, which is apt to be perplexing when an attempt is being made to determine whether surgical treatment is necessary. During an epidemic of this disease, namely, "enteritis," "enterocolitis," or so-called "abdominal influenza," or "intestinal flu," any abdominal complaint is likely to be labeled with one of these terms until further developments make such a diagnosis untenable. All of these facts emphasize the importance of a thorough examination before arriving at definite conclusions. Too many children have died from overwhelming peritonitis following perforation of a gangrenous appendix because a diagnosis of "intestinal flu" was made after hasty and superficial examination.

After having determined that the acute disease is confined to the abdomen, an untiring attempt should be made to determine the exact character of the pathologic condition. In general, most acute abdominal lesions in children can be placed in one of two classes, namely, obstructive or inflammatory. Intermittent, colicky pain is suggestive of distention of a hollow viscus, such as the small or large intestine, appendix, kidney or ureter. Ordinarily this pain is referred by specific nerves to a definite somatic segment, the location of which offers a clue to the site of the real disease. On the other hand, sharp, constant pain is more apt to be due to irritation of the parietal peritoneum. Such irritation produces local pain and usually is situated over the site of the diseased organ. When obstruction is present, tenderness and rigidity are absent. It is only when the tissues have become devitalized that tenderness and involuntary rigidity are detected near the site of the lesion. However, if the abdominal disease is inflammatory in origin, localized tenderness is soon followed by true rigidity of the abdominal muscles.

EXAMINATION OF CHILDREN

If fine distinctions are to be made and the best results obtained, a different technic should be employed when examining children, because of their more delicate tissues, their reaction to physical and psychic stimuli and their emotional imbalance. In order to obtain co-operation, the confidence of the child must be gained and a definite effort made to minimize the disagreeableness of the procedure. The suspected site of the disease should not be touched until the end of the abdominal examination; for if the child is hurt at the start, it will be difficult to obtain a true comparison with other areas. After gently inspecting more distant parts, the hand is laid over the diseased organ. Skin tenderness, muscle spasm, deep tenderness, and finally, rebound tenderness, are tested in order. The whole procedure is performed while looking and talking to the child. This not only permits the physician to gain the child's confidence and to distract his mind but often mild degrees of tenderness can be detected by watching the patient's facial expression and body movements.

Rectal examination should never be neglected, especially when attempting to locate abdominal disease. Because of the small size of the child's anus the well anointed and gradually introduced examining finger, supplemented by gentle pressure on the abdomen from above, has ready access to all pelvic structures. If the exploration is done slowly and gently, little objection will be raised.

As most children have had previous experience with examinations of the ears, nose, throat, and chest and are usually upset by them, these measures are left to the end. The necessity for these investigations, even though the primary pathologic condition has been discovered in other parts of the body, cannot be emphasized too strongly. If there is still some question as to the diagnosis, roentgen films are often of indispensable value.

Disproportionate extremes in temperature, pulse rate and respiratory rate are often encountered in acute conditions in children. Usually the temperature in itself is of little assistance in diagnosis. The pulse rate is a more reliable guide but often may be little affected during the early stage of disease. Nevertheless, great variations from the usual relationship of temperature, pulse and respiration are important. When this occurs, the condition is more apt to require medical rather than surgical attention. A short period of observation will often do much to clarify the situation.

Stool examinations are even more important in diagnosis in children than in adults. Their frequency, gross characteristics, the presence of blood or mucus, and the presence or absence of bile, as well as the detection of various bacteria or parasites, are frequently the clues required for forming an accurate opinion. Small, ribbon-like stools may be due to a congenital stricture of the anus. In the infant, failure of meconium to appear suggests the presence of stenosis or atresia of the intestine. Most inflammatory lesions in the abdomen in children are associated with constipation, but there are exceptions. Blood in the stool of children may be discovered in a variety of conditions such as epistaxis, Meckel's diverticulum, intussusception, rectal polyp, enterocolitis or purpura hemorrhagica. The amount of blood present, its color, clotting characteristics, and admixture with mucus and fecal material must all be considered in making a diagnosis.

Repeated urinalyses and complete blood counts and erythrocyte sedimentation rates are essential parts of the examination. The presence or absence of albumen, sugar, blood, pus, casts and bile in the urine may be informative. Acute lesions of the renal tract are notorious for trapping the unwary and unsuspecting physician. However, it should always be remembered that pus and even blood in the urine are not diagnostic of a primary renal lesion; for both of these findings may be discovered in cases of acute appendicitis, particularly when the in-

flamed organ lies along the ureter or beside the bladder. The characteristics of both the red and white blood corpuscles are instructive in certain forms of anemia and in blood dyscrasias. The white blood cell count values should be considered as collaborative evidence, but they are never diagnostic in themselves.

DIAGNOSIS

As mentioned previously, the acute abdominal lesions from which children suffer usually differ remarkably from those observed in adults. While acute appendicitis is the most common condition found in both stages of life, intussusception and intestinal obstruction are more frequently experienced during childhood. Hypertrophy of the pyloric muscle, while ordinarily not considered an abdominal emergency, is an acute condition frequently encountered in children which requires rather prompt treatment. Fortunately, the field of acute abdominal disease in childhood is relatively narrow. Certain conditions, such as gastric or duodenal ulceration and malignant neoplasms, are extremely rare in early life. Acute salpingitis, which is seen so frequently in the adult female might also be considered in the same category as these latter ailments, but it is surprising at what an early age pelvic inflammatory disease may make its appearance.

When all available information is at hand, the history should receive special consideration. The character of the onset of the illness is important and may be diagnostic, as in cases of intussusception. The relationship between the time of onset and the development of the physical signs should be carefully estimated. If the child has been vomiting and has had abdominal pain for several days and physical examination reveals little evidence of distention or rigidity, the condition is not likely to require surgical intervention. A history of persistent pain followed by nausea or vomiting and associated with a rising pulse rate and diminished peristalsis should direct attention to the necessity for surgical treatment. On the other hand, when the nausea and vomiting precede the pain and the other symptoms just described, and when diarrhea is present, the patient is more apt to need medical therapy, unless intussusception is present. The diagnosis is made by fitting together the pattern formed by the history, symptoms, physical signs and laboratory aids. Then after weighing each fact in the balance of experience and judgment the nature of the disease is determined and appropriate treatment is instituted. Needless to say, no one is infallible in diagnosis, particularly in children. It is always well to remember, however, that delay in performing operation in the hope of making a complete diagnosis may have serious consequences.

ACUTE APPENDICITIS

Statistics reveal that the appendix is responsible for the great majority of acute abdominal conditions, since 90 per cent of the cases of acute abdominal disease in children under ten years of age and 75 per cent of the cases in adults are due to acute appendicitis. There is no age limit to appendicitis, several cases having been recorded in babies forty-eight hours old. However, the incidence of the disease increases with age, reaching a peak in the second decade of life.

Acute appendicitis in children is notorious for the rapidity with which the disease progresses. There is evidence to show that acute appendicitis is not at all times the same condition.[1] When appendicitis is coincident with, or immediately subsequent to, upper respiratory or other acute infections, the inflammation is usually hematogenous in origin and usually due to the streptococcus. In these instances, there is usually an explosive acute suppurative process present involving the entire wall with extensive areas of necrosis and hemorrhage. Early perforation, followed by generalized peritonitis, is the rule. This type of the disease is ushered in with symptoms of unusual severity. As a rule the attack is the first of its kind. These observations might

explain the occurrence of epidemics of acute appendicitis, particularly in the autumn and winter months. If the lumen of the appendix is obstructed by fecaliths, kinks, adhesions or foreign bodies, gangrene and perforation may occur early in the course of the disease because the blood supply to a portion of the organ has been interrupted and infarction occurs. Occasionally, the initial symptoms may not be marked, but may be initiated by attacks of colic-like pain. In contrast with streptococcic infection, the pathological process progresses rather slowly when injury to the mucosa results in invasion of the appendix by organisms of the colon bacillus type. If perforation does occur in such cases, there is a tendency for a localized abscess to develop rather than spreading peritonitis. Such a patient usually presents those signs and symptoms which one ordinarily associates with the textbook descriptions of appendicitis and he often gives a history of similar attacks.

A. DIAGNOSIS

The establishment of the diagnosis of appendicitis in children is usually more difficult than it is in adults because of the inability to obtain an accurate history and the lack of full co-operation on the part of the patient. The classical signs and symptoms of the disease, such as generalized abdominal pain, nausea or vomiting, the shifting of the pain to the right lower quadrant in four to six hours, the rise in temperature, leukocytosis, and localized tenderness and rigidity, scarcely need to be reiterated. Appendicitis manifests itself in much the same way in children, but one has to depend more on the cardinal symptom of pain and the fundamental sign of localized tenderness. If all children suffering from appendicitis conformed to the pattern just described, the diagnosis would not be difficult. But in many instances the clinical picture is distinctly atypical. There may be few or no anterior abdominal signs, little pain, slight nausea, no vomiting, a high or low temperature, and varying degrees of leukocytosis or even leukopenia. Tenderness will usually vary with the location of the appendix. It may be encountered under the liver when the cecum has not descended and arouse suspicion of hepatic or diaphragmatic inflammation. When the appendix is retrocecal, the pain and tenderness may be elicited in the region of the right kidney, suggesting pyelitis or other renal pathology. The presence of blood in the urine adds to the confusion. If the inflamed organ lies low in the pelvis, the pain will be felt centrally. There is often dysuria, resulting from irritation of the bladder, or an ineffectual diarrhea originating from sigmoidal or rectal involvement. Perhaps the most disconcerting finding is that in which the pain occurs only in the left side of the abdomen. This is sometimes due to a retroperitoneal appendix or to one attached to a long mesentery which extends across the midline. In a few instances the pain is referred to the left side without adequate explanation.

B. DIFFERENTIAL DIAGNOSIS

Regardless of how careful the investigation may be or how thorough the examination, mistakes in diagnosis are sometimes inevitable. No one is justified in criticizing a surgeon for removing a normal appendix, if the symptoms were suggestive of appendicitis and the diagnosis, although incorrect, was made within the time limits of safety. In view of the tragic consequences which might result from prolonged delay, particularly if there has been a history of catharsis, early operation is imperative. Bastianelli[2] explained the situation very aptly by stating: "When physicians are discussing whether a case is appendicitis or not, it is; when they are inclined to admit the possibility of appendicitis without being sure of it, it not only is, but is already perforated with more or less circumscribed peritonitis."

The condition which is most frequently mistaken for acute appendicitis is acute mesenteric lymphadenitis following upper respiratory infection. The infective or-

ganisms presumably are swallowed, pass through the intact mucosa, enter the lymphatic channels and produce inflammation of the mesenteric nodes, which are particularly numerous in the ileocecal region. The signs and symptoms may exactly simulate those of acute appendicitis and there is no certain way to differentiate between the two conditions.

The symptoms and signs of food poisoning may imitate those of acute appendicitis. The products of many micro-organisms have been found to cause intestinal upsets. These attacks are usually ushered in by violent vomiting and diarrhea, associated with abdominal pain. Localized tenderness is rare. The tenderness often follows the course of the colon. When diarrhea is the first symptom or when nausea and vomiting precede pain, the patient is not likely to be suffering from acute appendicitis. However, as in all generalizations, there are exceptions. In such instances, the physical findings may provide the deciding evidence.

Acute primary peritonitis is extremely difficult to differentiate from acute appendicitis complicated by perforation and peritonitis. These obscure infections are by no means confined to female children, although the vagina and Fallopian tubes are frequent portals of entry. However, the patient is sicker from the onset; the fever is higher; the additional signs are more generalized; and diarrhea is more apt to be associated with primary peritonitis than it is with appendicitis. It is evident that the manifestations of the disease are not distinctive and in some instances the diagnosis can not be made until the character of the peritoneal exudate is investigated.

The early symptoms of acute tonsillitis, lobar pneumonia, diaphragmatic pleurisy, renal pathology, and acute lesions of the spine and hip may be largely abdominal. The differentiation of these conditions has already been considered.

C. TREATMENT

When the inflammatory process is confined to the appendix, there is universal agreement that the only form of treatment advisable is immediate removal of the diseased organ. If this procedure is adhered to, the mortality rate from appendicitis is negligible. The few deaths that do occur are caused by some uncontrollable factor, such as pulmonary embolus, which hazard always exists following any major surgical undertaking.

If the appendix has ruptured and a localized inflammatory mass is found on initial examination, it appears logical not to interfere with the defensive mechanisms of the body which come into play in walling off the infection before operation is performed. This may result in a short delay, but when the abscess is drained through a small incision, there is less likelihood of contaminating the entire peritoneal cavity. It is always a temptation, when draining an appendiceal abscess, to remove the offending organ at the same time. If the appendix is easily exposed after evacuation of the pus, it can usually be removed before closing the wound, without undue risk. But if the appendix is not readily accessible and if its exposure necessitates the breaking down of protective barriers about the abscess, the mortality rate has been shown to be lower if the appendix is not disturbed. In such instances appendectomy may be performed with safety from six weeks to three months later, after the acute inflammatory process has subsided.

Those instances in which the appendix ruptures early in the course of the disease, before the peritoneal cavity has had time to mobilize its defensive forces, offer a more serious problem. The physical findings tend to be of a generalized rather than of a localized nature. The acute general tenderness and rigidity suggest rapidly spreading peritonitis. While the treatment of this form of the disease has been the subject of wide controversy, there is increasing evidence to show that operation with removal of the source of infection has more to offer than conservative treatment.[3] This is particularly true in children for it has been convincingly shown that they do not

tolerate peritonitis nearly as well as adults.[4] They can not endure the starvation of the Ochsner mode of therapy and it is extremely difficult to obtain the co-operation that is so essential to the success of this form of treatment.

In recent years there has been a tendency toward less and less drainage following removal of a ruptured appendix. Those ascribing to this practice believe that it is impossible to drain the entire peritoneal cavity and that the drain acts as an irritating foreign body which hinders the natural defensive processes of the peritoneum.[5] This may be true as far as generalized peritonitis is concerned. However, until more conclusive evidence is offered as to the efficacy of this form of treatment in the more localized types of peritonitis, I have compromised to the extent of inserting a black, soft rubber, split tube drain for a short period. Such a drain rapidly establishes a sinus tract and is the only one which encourages drainage instead of blocking it. Elevation of the drain on the third postoperative day and removal two days later eliminates the danger of the development of a fecal fistula. In cases of perforation of retrocecal appendices such drainage tends to forestall the formation of a subdiaphragmatic abscess. The peritoneum is closed about the drain and the rest of the wound is loosely approximated with one or two through-and-through silkworm sutures. Such a procedure minimizes the likelihood of serious infection of the wound and of the adjacent abdominal wall.[3] Furthermore, the incidence of postoperative ventral hernia is less than if the wound is carefully sutured.

ACUTE INTESTINAL OBSTRUCTION

Acute intestinal obstruction is especially dangerous in children because they do not tolerate shock, dehydration or toxemia. In addition, the obstruction in young patients is frequently situated high in the intestinal tract, which makes the situation much more serious. The etiologic factors are somewhat different than in an adult. Congenital atresias, stenosis by bands, intussusception and obstruction by Meckel's diverticula are common in childhood but rare in adults. Postoperative obstruction is probably the most frequent form encountered in adults, but this is not so in children. Tumors are much rarer in the young than in adults.

A. SYMPTOMS AND SIGNS

The three cardinal symptoms of acute intestinal obstruction are pain, vomiting and constipation. The onset of the pain is sudden. The child often cries out and the legs are drawn up. At first the pain is colicky in character, but soon becomes constant. Early in the course of the disease the discomfort is felt in the region of the umbilicus; but when the colon is obstructed, the pain may be more marked in the lower part of the abdomen. Not infrequently, varying degrees of shock are detected at this stage of the illness.

Vomiting begins almost immediately. The frequency and persistency of the vomiting are distinguishing features of the condition. When on the third or fourth day the late sign of fecal vomiting makes its appearance, it is pathognomonic. The constipation is absolute. The administration of an enema may result in the emptying of the intestine below the obstruction together with the passage of a small amount of flatus. This may lead to an erroneous diagnosis of incomplete intestinal obstruction.

On examination, the temperature is generally about normal, the pulse rapid and feeble and the child appears frightened. The hernial orifices should be examined, and in the newly born infant the anus must not be overlooked. Palpation of the abdomen is of most value before distention occurs. Voluntary resistance and generalized tenderness are frequently detected at this time. Distention is a late sign of the disease and is only pronounced in low intestinal obstruction. Visible peristalsis is not common in acute obstruction. Audible peristaltic sounds of a tinkling variety at

the height of the intermittent abdominal pain characterize intestinal colic.[6] If the viability of the intestine is not impaired, there is usually no localized or rebound tenderness of the abdomen or true rigidity of the abdominal muscles. In case there is doubt as to the diagnosis, a flat plate of the abdomen or a barium enema may yield much information, but these procedures are not required ordinarily. Needless to say the barium should never be given by mouth.

B. TREATMENT

Success in the treatment of acute intestinal obstruction in children depends almost entirely upon the speed and accuracy with which the diagnosis is made and upon early operation, for the condition is as rapidly fatal as in adults. Saline solution given parenterally in amounts sufficient to promote a satisfactory urinary output, depending on the age of the child, is almost a specific for the dehydration and chloride deficiency encountered in intestinal obstruction. The administration of a cathartic or morphine before a definite diagnosis has been made is distinctly contraindicated. An enema may be tried, but never a cathartic, if there is any suspicion of an acute obstruction. Pituitrin, pitressin, or prostigmin are given at times when the obstruction is incomplete, but their use is dangerous in cases of acute obstruction.

The actual operation depends on the cause of the obstruction and the vitality of the involved intestine. Unless there is definite evidence to indicate in which portion of the abdomen the obstruction is located, a paramedian incision which can be enlarged either upward or downward will give ready access to any portion of the intestinal tract. Bands or adhesions can be divided and any strangulated loop of bowel freed quite easily. If a portion of intestine appears to be no longer viable, the question of resection arises. Not infrequently after the strangulation is relieved, the dark color of the bowel is found to be due to extensive hemorrhage into the wall. The prompt or gradual return of the circulation to the part can be detected in these instances and resection is not necessary. However, when resection of intestine is required, because of the high mortality of such a procedure in children, it is often best to leave the gangrenous loop outside of the abdomen either with or without a short-circuiting lateral anastomosis.

After operation some time must elapse before the fatigued intestine can resume its tone and function. Purgatives, stimulants, and copious enemas are not required. Water should be restricted by mouth and the fluid and crystalloid balance maintained by supplementary injections of saline solution. Sedatives and morphine are helpful. Hot fomentations placed on the abdomen are comfortable and promote recovery of intestinal tone. At times, when co-operation can be obtained, the decompression can be aided by applying constant suction to a small nasal tube which has been passed into the duodenum.

HERNIA

For all practical purposes, the only external hernia which may become obstructed in children is the inguinal hernia. An irreducible inguinal hernia is not uncommon. If the patient is placed in the Trendelenburg position and an ice cap applied, the intestine may return to the abdominal cavity. At times strangulation of the bowel occurs. In such instances the child may scream from pain. Vomiting develops as well as absolute constipation. Relief of the condition by early operation is essential.

INTUSSUSCEPTION

Intussusception accounts for at least 75 per cent of all cases of acute obstruction in infancy and childhood. Although found at any age, it is commonest between the ages of six months and two years. Any portion of the intestinal tract may be involved, but the enterocolic form is encountered most frequently. The condition appears to be less common than formerly. This may be due to the greater care taken

in the feeding of children during recent years.

A. DIAGNOSIS

Ordinarily it is not difficult to make the diagnosis. A child who has previously been in good health and suddenly develops acute abdominal pain which comes on intermittently and is accompanied by shock, tenesmus, the passage of bloody mucus by rectum, the presence of a sausage-shaped abdominal tumor, and later by increasing distention and vomiting, is undoubtedly suffering from intussusception. It is important for the physician who is called first not to be misled by the healthy and happy appearance of the child between the attacks of pain. He should wait for an attack before leaving, because otherwise he may be deluded into a false sense of security and thus may delay institution of early, life-saving surgical treatment.

Enterocolitis is the condition which is probably the most difficult to differentiate from intussusception during infancy. However, in this disease there is usually a preliminary diarrhea without blood; the stools contain more fecal material and are more frequent; the abdominal pain is less intense; tenderness is noted along the course of the entire colon; and finally, there is no abdominal tumor.

B. TREATMENT

From time to time nonoperative methods have been advocated in the treatment of intussusception.[7] Reduction by rectal injection of either air or fluid has been employed. However, these measures are not without risk, for not only is valuable time lost if the treatment is unsuccessful, but there always remains some question whether the refractory last inch of the involved intestine has been completely reduced.

Early operation,[8] that is, within the first twenty-four hours, is the only method of treatment in which there is any certainty of recovery. This is due to the fact that in most instances the intestine is viable and the intussusception can be fairly easily reduced if the attempt is made within a few hours after the onset. Late operation entails grave risk with a mortality varying from 50 to 80 per cent, particularly if resection of gangrenous intestine is required. When the intestine becomes strangulated, it is thickened and friable, and reduction is extremely difficult. While many times the bowel appears to be excessively damaged, it is surprising how much recovery can take place. A glistening loop of intestine, although quite severely injured, should be replaced into the abdomen. Resection in such cases, especially in infants, is almost invariably fatal, while recovery of the damaged intestine is the rule. Excision of a Meckel's diverticulum or removal of the appendix had best be deferred. Various types of resections and short-circuiting procedures have been performed, if the intussusception is irreducible. However, if the intestine is no longer viable, it may be best to bring the mass out of the abdomen and leave a double enterostomy. Edematous, distended bowel is poor material with which to make an anastomosis. Since the operation is a life-saving measure, all other considerations are of secondary importance. From these facts it is readily discernible that the essential factor in improving the mortality rate in intussusception is a reduction of the time between the onset of symptoms and the surgical operation.

INFECTION OF THE URACHAL REMNANT

The urachal remnant is a rare source of acute abdominal infection, usually originating at or near the umbilicus. Ordinarily an abscess develops in the abdominal wall, which may appear to be intraperitoneal. Subsequent invasion of the peritoneum may occur. Early operation with drainage of the abscess is indicated. Removal of the urachal remnant should be deferred until a safer period when the acute inflammation has subsided.

MECKEL'S DIVERTICULUM

Meckel's diverticulum results from persistence of a portion of the omphalomesenteric duct. It is present in about 2 per cent of individuals and is attached to the ileum approximately two to three feet proximal to the ileocecal valve. It often persists throughout life without producing symptoms or it may cause at any time, but particularly in childhood, intestinal hemorrhage, acute inflammation, perforation, peritonitis or intestinal obstruction. When acutely inflamed, it presents symptoms quite similar to those of appendicitis. Differentiation of the two conditions is extremely difficult except in instances in which the pain from the diverticulum is located in the left iliac fossa or in which there is intestinal hemorrhage. A Meckel's diverticulum must always be ruled out when a history of intestinal bleeding is obtained in a child. If the abdomen is opened because acute appendicitis is suspected, and the appendix is not found to be inflamed, the intestine should always be explored for the presence of one of these remnants. The treatment is the same as for acute appendicitis.

GALLBLADDER AND PANCREAS

Acute lesions of the gallbladder and pancreas are rare in children, but they should not be overlooked entirely. Acute cholecystitis, with or without calculi, and gangrene and perforation of the gallbladder, as well as acute pancreatitis, have been reported as occurring during childhood.

TUMORS

There are some abdominal tumors in children which may necessitate emergency treatment. While not common, ovarian masses, usually cystic in character, occasionally become twisted on their pedicle. These lesions can be felt on rectal examination and should be removed before necrosis occurs. Intestinal polyps are rather common. At times, by causing torsion or inversion of the intestine, surgical intervention is requested.

Although ordinarily not classified as an acute disease, there is a pseudotumor of the pylorus, or in reality, hypertrophy of the pyloric muscle, which requires prompt treatment followed by operation a short time later. The congenital form, which is the type under consideration, manifests itself during the first weeks or even during the first days of life. The chief characteristics of the condition are the early development of obstinate, expulsive vomiting, visible peristalsis of the stomach, constipation and a pyloric tumor. The presence of bile in the vomitus is evidence against the existence of pyloric stenosis. Congenital lesions such as atresia of the pylorus or duodenal stricture may confuse the diagnosis but these conditions are rare. An opaque meal may be of some aid in making these distinctions but such a procedure is rarely necessary. After combating the dehydration which is invariably present and improving the patient's general condition, the Rammstedt operation offers the best chance for prompt cure.

SUMMARY

There are some acute surgical conditions frequently encountered in children which are rare in adults. Acute diseases common to both childhood and adult life may manifest themselves differently in the young and require different forms of treatment. In children, it is not unusual for pathological lesions situated in distant parts of the body first to produce referred symptoms in the abdomen. A different technic should be employed when examining young individuals. Success in diagnosis depends upon the ability of the physician to manage the patient.

There is no age limit for appendicitis. The disease in the young is notorious for the rapidity with which it progresses. Prompt diagnosis and removal of the organ before perforation occurs assures recovery. Even when rupture has taken place, eradication of the source of infection offers the best hope of a favorable outcome.

The causes of acute intestinal obstruction in children are not always the same as those found in older patients. Young individuals are unable to tolerate the shock, dehydration and toxemia which accompany the condition. The mortality is high unless immediate relief is obtained.

Intussusception is the most common surgical emergency encountered in infants under two years of age. Reduction constitutes the only safe method of treatment which assures a good chance of recovery. As this is possible only during the early stages of the disease, prompt diagnosis and immediate surgical intervention are necessary to save the child's life.

The urachal remnant and Meckel's diverticulum are uncommon sources of acute abdominal disease. Nevertheless, these structures, as well as abdominal tumors and lesions of the biliary system must be kept in mind when dealing with acute abdominal disease in children.

BIBLIOGRAPHY

1. Westermann, Jr., J. J. The mortality of acute appendicitis as related to clinical types and treatment. *New York State J. M.*, 34: 388–392, 1934.
2. Bastianelli. Quoted by Mayo, C. W. Appendicitis. *South. Med.*, 18: 397–403, 1934.
3. Horsley, J. S., Horsley, Jr., J. S. and Horsley, G. W. Appendicitis; newer methods of treatment. *J. A. M. A.*, 133: 1288–1293, 1939.
4. Elman, R. Peritonitis due to ruptured acute appendicitis in children; influence of delay on operative mortality. *Am. J. Digest. Dis.*, 5: 804–807, 1939.
5. Shipley, A. M. Appendicitis with peritonitis; treatment without drainage. *South. Surg.*, 3: 308–315, 1934.
6. Wangensteen, O. H. The early diagnosis of acute intestinal obstruction with comments on pathology and treatment with a report of a successful decompression of three cases of mechanical bowel obstruction by nasal catheter and suction siphonage. *West. J. Surg.*, 40: 1–17, 1932.
7. Hipsley, P. L. Intussusception and its treatment by hydrostatic pressure: based on an analysis of one hundred consecutive cases so treated. *M. J. Australia*, 2: 201–206, 1926.
8. Ladd, W. E. and Gross, R. E. Intussusception in infancy and childhood: a report of three hundred and seventy-two cases. *Arch. Surg.*, 29: 365–384, 1934.

LOCAL AND GENERAL TEMPERATURE REDUCTION IN MALIGNANCY

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THE concept of influencing the course of malignant neoplasms by means of low local temperatures was brought to the attention of the profession by the work of Fay and Henny[1] of Philadelphia. Their work began in 1936 and came as a result of correlating segmental temperatures of the body in respect to the locations of primary carcinomas and their metastases. Accessible tumors were subjected to the local application of cold. In an effort to influence metastatic malignant cells in otherwise inaccessible parts of the body, Smith and Fay[2] produced a general lowering of body temperature below the critical level of 95 degrees F. Their clinical results were listed as follows: (1) Reduction of pain; (2) decrease in size of lesion; (3) general improvement in patient's condition; (4) retardation of recurrences; and (5) degeneration of tumor cells as determined by biopsy.

The thought that low environmental temperatures might have a retarding or destructive effect on immature, undifferentiated malignant cells is not a new one; but while the subject has received considerable attention from a number of investigators during the past ten years, the studies reported have been applied to tissue cultures and to laboratory animals. The general reduction of body temperature has also received some attention in connection with studies on general body nutrition and metabolism.[3,4,5] Smith and Fay, however, first produced critical states of hypothermia, as low as 85 degrees F. in human subjects.

Our experiences with this method of influencing malignant growths have been confined to a series of fourteen patients suffering from far advanced and inoperable cancers. Most of these patients had received deep *x*-ray therapy in dosages to the limit of tolerance.

The purpose of this paper is a presentation of this series with end results and the technic employed.

LOCAL APPLICATION OF COLD

The refrigeration apparatus used for the local application of cold was composed of a thermostatically regulated, water cooling unit and a circulating pump, the mechanism being controlled by a needle valve, a pressure gauge, a flowmeter and thermometers on the outlet and inlet lines. Cold water was circulated at a constant temperature through specially constructed applicators. These applicators are best illustrated by those used in connection with carcinomatous lesions of the breast. A plaster cast was molded to fit the tumor, the breast and the axilla, and from this cast a form was poured. Copper sheets were pounded to the form to obtain an applicator that made perfect apposition with the area marked off for refrigeration. Nickel and chromium plating were applied.

Local refrigeration was used in several instances for as long as 400 to 500 hours at temperatures of 48 to 50 degrees F. Cold was applied continuously except for short intervals when the applicators were re-

moved for observation or because of local complications. Superficial areas of the tumors became necrotic and were cut away from time to time. Microscopically, sections of these pieces showed cell necrosis. In several instances there were areas of sloughing in normal tissue. This superficial necrosis with sloughing was practically constant over the tumor tissue but was infrequent in normal tissue. The greatest depth of necrosis was 6 mm. Clinically, we observed relief from pain within twenty-four hours and a reduction in size of the tumor mass.

Some work has been done in connection with the depth to which low temperatures applied to the skin are effective. Zondek[7] reported that an ice bag applied to the thigh caused a fall of temperature, at a depth of 50 mm. from 37.1 degrees C. to 36.3 degrees C. in one hour, when the skin temperature had fallen to 7 degrees C. An ice bag applied to the abdomen of an obese subject (fat, 50 mm.) for one and one-half

CHART I

Patient	Location of Primary Lesion	Previous Treatment	Metastatic Lesions	Biopsy Report	Local Cold No. Hours	General Cold No. Hours below 90°F.	Drugs General Cold
1. K. H.	Breast	Palliative mastectomy; *x*-ray	Liver	Ca.	346	None	
2. A. E.	Cervix	Radium	Pelvic extension to rectum	Ca.	792	None	
3. J. L.	Prostate	*X*-ray	Lung and bone	None	None	120	Nembutal 18 gr. Luminal 5 gr.
4. G. C.[1]	Ovary	Exploratory; *x*-ray	Pelvic extension	Ca.	240	10	M.S. gr. ½ Nembutal 9 gr. Paraldehyde dr. 2
5. G. C.	Ovary	See above	See above	See above	See above	48	Nembutal 33 gr.
6. I. K.	Bladder	Fulgeration; *x*-ray	None	Ca.	384	51	Pentothal 9½ gr. Nembutal 10½ gr. S. Luminal 35 gr.
7. A. L.	Breast	Surgery; *x*-ray	None	Ca.	504	53	Nembutal 6 gr. S. Luminal 32 gr.
8. M. L.	Breast	Surgery	None	Ca.	504	54	Pentothal 7½ gr. Nembutal 6 gr. S. Luminal 38 gr.
9. W. D.[2]	Rectum	Surgery; *x*-ray	Perineum; vulva; inguinal glands	Ca.	236	.....	Nembutal 16½ gr. Pentothal 7½ gr. S. Luminal 16 gr.
10. W. D.	Rectum	See above	See above	See above	See above	38	Nembutal 38½ gr.
11. Z. J.	Breast	*X*-ray	None	Ca.	504	2½	Pentothal 5 gr. Nembutal 15 gr.
12. Z. J.	Breast	*X*-ray	None	Ca.	See above	30	Nembutal 25 gr.
13. C. B.	Cervix uteri	*X*-ray	Lung?	Squamous Ca.	.....	48	Nembutal 34 gr.
14. P. D.	Stomach	Exploratory; *x*-ray	Abdomen	Squamous Ca.	.....	72	Nembutal 29¾ gr.
15. E. Q.	Foot	*X*-ray; surgery	Inguinal lymphnodes	Melano sarcoma	.....	48	Nembutal 29 gr.
16. T. L.	Lung	*X*-ray	Lung	Bronchogenic carcinoma	.....	55½	Nembutal 17½ gr.
17. M. J.	Breast	Surgery; *x*-ray	General	Ca.	.....	27	Nembutal 29⅛ gr.

[1] Second general treatment.
[2] Unable to depress temperature below 94.6°F.

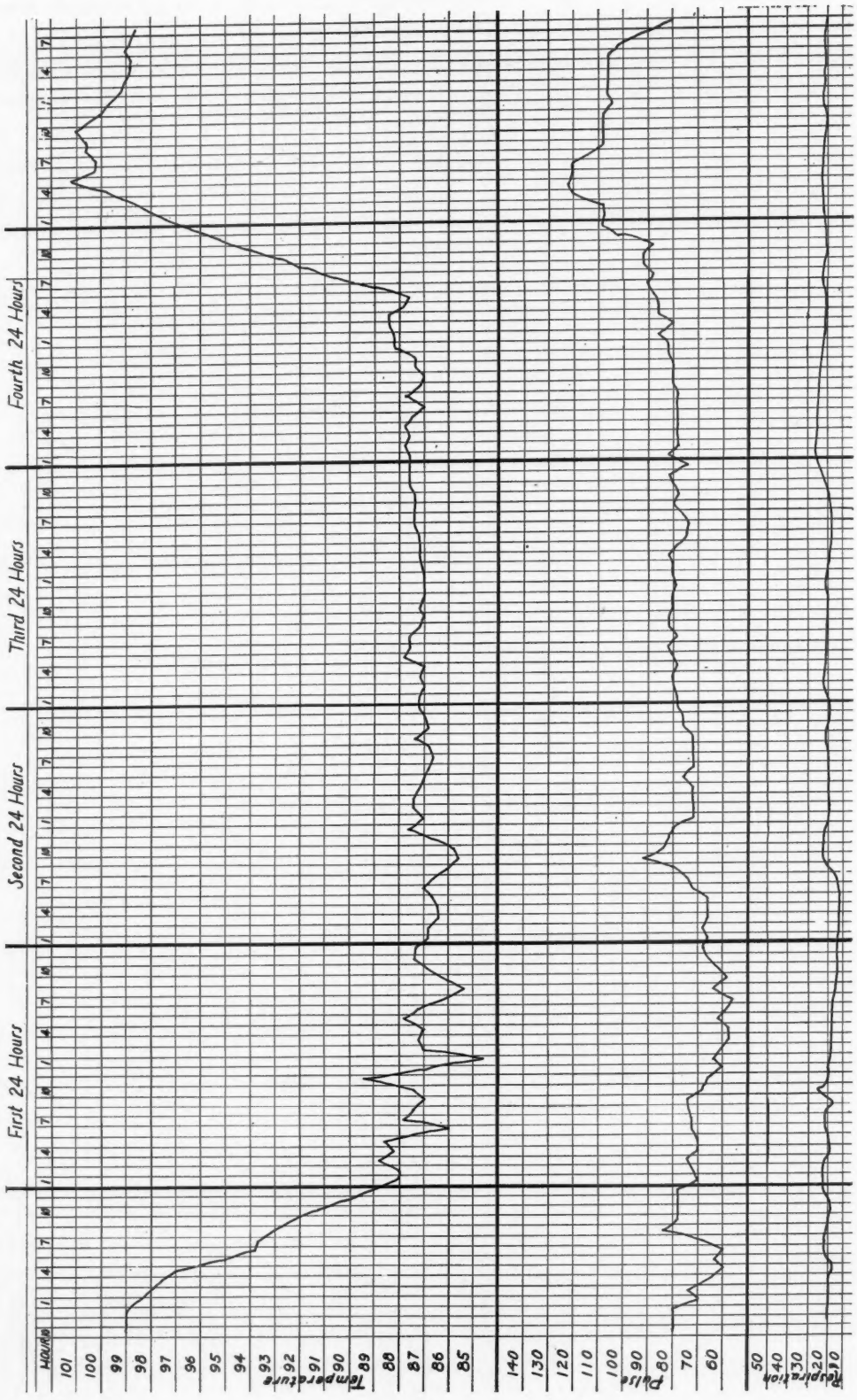
First 24 Hours
Second 24 Hours
Third 24 Hours
Fourth 24 Hours
Hours
Temperature
Pulse
Respiration

Chart II.

hours caused a fall of skin temperature to 6 degrees c., but the abdominal muscle temperature, at a depth of 50 mm., fell only from 37.6 degrees c. to 36 degrees c., and cold applied locally to the surface of an accessible tumor of moderate size, e.g., with a 2 cm. diameter, has more than a superficial effect. However, several factors

CHART III

Patient	General Cold; No. Hours below 90°F.	Blood R.B.C. Millions				Blood W.B.C.—M.				Differential Neutrophils—M Small Lymphos—M.			
		Before Treat.	1st 24 Hours	2nd 24 Hours	3rd 24 Hours	Before Treat.	1st 24 Hours	2nd 24 Hours	3rd 24 Hours	Before Treat.	1st 24 Hours	2nd 24 Hours	3rd 24 Hours
1. K. H.	None	4.3	4.5	...	...	9.0	9.0	....	...	8.3 0.5	7.2 1.8		
2. A. E.	None	4.4	...	...	3.1	8.0	....	....	16	4.3 2.4			
3. J. L.	120	3.3	4.2	4.2	3.8	8	14	12	10	6.1	13.2 .56	11.5 0.48	8.3 1.0
4. G. C.	10	3.8	4.6	4.2	...	12	22	24	15	10.2 1.2	19.1 2.9	20.9 1.9	13. 1.5
5. G. C.[1]	48	4.1	4.0	4.5	4.3	8	12	18	9	6. .96	10.3 1.2	17.3 0.7	7.4 1.3
6. I. K.	51	4.4	...	4.8	...	6	....	14	...	4.8 0.8	....	12. 1.6	
7. A. L.	53	4.0	5.5	...	...	8	20	....	...	5.4 2.1	17 2.6		
8. M. L.	54	3.8	4.5	4.6	3.8	7	20	40	26	5. 1.6	18 .6	36 1.2	23 2.6
9. W. D.[2]	None	4.4	4.8	...	...	9	26	....	...	5.8 2.8	23.4 2.5		
10. W. D.[1]	38	4.0	5.5	...	...	12	24	....	...	10.5 .96	22		
11. Z. J.	2½	4.0	...	...	...	12	....	....	...	8.6 2.5			
12. Z. J.[1]	29	4.2	5.0	...	...	8	20	....	...	5.6 2.	18 1.6		
13. C. B.	48	2.4	4.5	4	3.2	6	10	11	14	4.3 1	8.3 1	9.6 1.3	12.5 1
14. P. D.	72	5.3	6.8	6.4	5	9	9	5	4	6.6 2.1	7.5 1.2	3.5 1.3	3.2 .72
15. E. Q.	48	4.4	5	5	...	10	8	16	...	6.4 3.2	5.8 1.8	14.6 .8	
16. T. L.	55½	3.5	5	5	4.2	10	14	5.5	12	7.7 1.1	12.4 1.2	4.6 6.6	11.2 .72
17. M. J.	27	4	5.6	...	...	7	12	....	...	2.5 3.2	6 3		

[1] Second treatment.
[2] Unable to depress temperature below 94.6°F. See Chart 1.

then attained equilibrium. Harkins and Harmon[8] have made some measurements on subcutaneous temperature reduction following the local application of cold.

These studies suggest that the depth of heat loss beneath local cold applicators is not great, and it is questionable whether must be considered. Cold applied locally gains its depth effectiveness by withdrawal of heat from within the body; and, theoretically, a cold applicator would eventually exhaust body heat if heat production was not increased above the normal rate. Since, however, body heat production is

accelerated when cold is applied locally, the effectiveness of cold is lost, with the exception of a few mm. at the surface of the body, because of the establishment of an equilibrium, heat supply balancing heat loss.

patients. All of these patients were suffering from far advanced and inoperable malignant growths and all of them had received surgical or irradiation therapy, or combinations of both, previous to hypothermia. Arbitrarily, a temperature of 90 degrees F., or less, was used in determining the duration of hypothermia.

CHART IV

Patient	General Cold; Hours below 90°	Blood Chemistry Sugar				Blood Chemistry N. P. N.				Blood Chemistry Urea N.				Urine			
		Before Treat.	1st 24 Hours	2nd 24 Hours	3rd 24 Hours	Before Treat.	1st 24 Hours	2nd 24 Hours	3rd 24 Hours	Before Treat.	1st 24 Hours	2nd 24 Hours	3rd 24 Hours	Before Treat.	1st 24 Hours	2nd 24 Hours	3rd 24 Hours
1. K. H.	None	...	...	...	...	..	..	..	..	..	..	..	..	Neg.	Neg.		
2. A. E.	None	...	...	...	...	..	..	..	..	..	..	..	..	W.B.C. R.B.C.	.....	.....	W.B.C. R.B.C.
3. J. L.	120	91	83	91	...	33	62	88	67	14	25	47	33	Albm. trace	Albm. casts	.....	Albm. casts
4. G. C.	10	100	125	...	...	36	44	..	..	16	15	..	..	Neg.	Albm. trace		
5. G. C.[1]	48	100	143	105	...	25	32	32	29	12	18	14	14	Neg.	Neg.	Albm. casts	
6. I. K.	51	91	...	98	...	36	..	42	..	16	..	12	..	Albm.	Albm.	Acetone	W.B.C.
7. H. L.	53	95	95	...	100	32	47	..	47	12	20	..	25	Neg.	Neg.	Albm. casts	Neg.
8. M. L.	54	100	71	90	220	25	40	30	29	14	20	16	13	Neg.	Sugar acetone	Sugar acetone	Sugar acetone casts
9. W. D.[2]	None	105	90	...	...	31	42	..	..	12	21	..	..	Albm.	Albm.		
10. W. D.[1]	38	105	33	19	222	32	53	94	64	12	18	32	29	Albm.	Albm.	Albm. acetone	Sugar albm, acetone casts
11. Z. J.	2½	116	120	...	97	40	50	..	37	14	22	..	16	Sugar	Acetone albm.		
12. Z. J.[1]	29	...	100	...	110	..	61	..	42	..	14	..	..	.....	Albm. acetone casts	Albm. acetone casts	Neg.
13. C. B.	48	105	125	200	182	23	26	19	23	13	11	9	10	Albm. R.B.C. W.B.C.	Neg.	Neg.	Neg.
14. P. D.	72	80	111	63	53	36	50	44	29	18	19	21	16	Neg.	Sugar casts	Sugar casts	Neg. casts
15. E. Q.	48	111	111	100	...	30	33	30	..	12	14	14	..	Neg.	casts	Albm. casts	
16. T. L.	55½	97	143	100	95	25	33	43	44	10	14	12	21	Neg.	Albm. cells	casts	sugar casts
17. M. J.	27	95	143	...	...	26	44	..	..	12	23	..	..	Albm.	casts		

[1] Second treatment.
[2] At no time did temperature go below 94.6°F.

HIBERNATION

General hypothermia, "hibernation," was produced fourteen times in twelve

Three methods of applying external cold were used: ice packs, ice bags and the

continuous flow tub. Ice bags were quite satisfactory for most patients, ice packs and the continuous flow tub being used for those who were relatively more obese. Ice was more conveniently handled when placed in ice bags, and variations in the cold environment were more easily and more quickly obtained. Room temperature was maintained at 45 to 50 degrees F.

The patients were given nembutal in 1½ gr. doses at half-hour intervals until adequately narcotized. If adequate narcosis was not obtained by nembutal, gr. 7½, by mouth, a 5 per cent solution of nembutal was administered intravenously until a stage of light surgical anesthesia was teached. For maintainance of the narcorized state nembutal was given intramuscularly in ¾ gr. doses at necessary intervals. It has been pointed out that nembutal itself has a slight depressing action on body temperature and lowers the temperature that must be reached by the body to initiate the shivering reflex. Kohn-Richards and Grimes[9] found that in experimental animals high temperatures in general increase the toxicity of nembutal while low temperatures decrease toxicity. This decrease in toxicity is present until a certain temperature level is reached, after which point toxicity increases. In frogs, 10 degrees C. appears to be a critical level below which the toxicity of nembutal rises.

A certain amount of narcosis is necessary to prevent increased muscular tension, restlessness and shivering, factors which tend to elevate a subnormal temperature. Swift[10] showed, by exposing human subjects in a basal state to an environmental temperature of 2 degrees C. for periods of more than one hour, that heat production is proportional to the amount and to the intensity of shivering; and he concluded that any increase in metabolism that is not accompanied by definite shivering, may be justly ascribed to increased muscular tension. He concluded that shivering increases the metabolism approximately 400 per cent. Effective narcosis eliminates shivering and brings about muscular relaxation.

Temperatures were taken with electric resistance thermometers, either indicating or recording type. These instruments are more accurate than the ordinary clinical variety. The bulbs were inserted into the rectum for a distance of 10 cm. These deep rectal temperatures were checked by vaginal, axillary and colostoma temperatures and also by measuring the temperature of catheterized urine. The temperature in a stream of urine is 0.3 to 0.5 degrees F. below rectal temperature.

There was a rather constant and sharp drop in temperature during the hours between 3:00 and 6:00 A.M. When the temperature dropped too quickly, or fell below a predetermined level, ice was removed, in whole or in part, and sedative drugs were withheld until there was some indication that the fall had been interrupted. Heat was applied to the extremities but with caution. Sudden change from a cold to a warm environment produced rapid respiration, a very rapid and shallow pulse and restlessness. During the induction stage we allowed the temperature to drop at the rate of approximately 1 degree per hour until the level of 86 to 87 degrees F. was reached. In one instance, because of too heavy initial narcosis, the temperature fell from 98.6 degrees F. to 86 degrees F. in a period of two hours. The patient presented a rather severe state of collapse, but was restored satisfactorily following removal from the ice pack.

The temperature ranges used in this series were purely arbitrary, representing, we believed, a satisfactory reduction below the critical level of 95 degrees F. Britton[4] recorded instances of rectal temperatures in human subjects reaching as low as 75 degrees F. with eventual recovery. In homothermal animals temperatures may be depressed to 60.8 degrees F. without any demonstrable ill effects following recovery.

To establish a workable technic for the production of hypothermia we set a limit of forty-eight hours, during which the temperature was maintained within the determined range. Following the required

number of hours at temperatures ranging between 85 and 87 degrees F., the ice pack was removed gradually and the patient was placed in bed at room temperature. Ice bags were kept to the head. Body temperature rose slowly, reaching normal in eight to ten hours. Frequently the temperature remained elevated to 99 or 100 degrees F. for twelve to twenty-four hours after recovery. Fluids were given parenterally until the patient was able to swallow and at that time liquids and soft foods were given as tolerated.

One obese patient, age 33, height sixty-five inches, weight 185 pounds, basal metabolic rate −13, was packed in ice for thirty hours with no temperature reduction below 94.6 degrees F. A second attempt was made using the continuous flow tub. During the first four hours, the temperature failed to drop below normal. Following the administration of insulin, seventy-five units during the next twenty-four hours, body temperature was reduced to 85.2 degrees F. The lowest blood sugar determination was 19 mg. per cent. During the remainder of the period of hypothermia temperature rises were obtained by the use of adrenalin or glucose intravenously, and temperature drops were obtained by the use of small amounts of insulin. Recovery was uneventful.

Suomalainen[11] produced hibernation in warm blooded animals by the intravenous injection of insulin and magnesium chloride. He found that these substances caused a drop in blood sugar content to less than half normal in European hedgehogs and produced a cold-blooded state characteristic of warm-blooded animals in hibernation. The animals remained asleep as long as he kept them in a refrigerator at temperatures near zero centigrade. When he removed them to a warm room, they awoke and returned to a normal warm-blooded state.

The adrenal mechanism has been shown to be specifically concerned in the regulation of body temperature. Britton[4] found that small amounts of adrenalin injected intravenously into animals in which artificial hibernation had been induced, stimulated reactions that tended to bring about a re-establishment of normal body temperature (promotion of glycogenolysis and shivering).

Finney, Dworkin and Cassidy[12], working with animals, produced a condition simulating hibernation by means of insulin and cold and restored the animals with adrenalin and pituitrin.

In none of the patients subjected to general hypothermia was it our experience to note a complete cessation of kidney function. Smith and Fay[15] stated that urinalysis in all of their cases had shown nothing of pathologic significance. All of our patients showed abnormal urinary findings in catheterized specimens taken during hypothermia. Vaughn[16] reports no urinary findings. In our series 5 per cent glucose in normal saline was administered in 1,000 cc. amounts at twelve hour intervals. The urine commonly contained albumin, acetone and casts, both granular and hyalin. After twenty-four hours of temperatures at 86 to 87 degrees F., the urine frequently cleared and remained clear until hypothermia was terminated.

Smith and Fay[15] found no evidence of nitrogen retention in a series of thirty-three cases. In later cases they administered fluids enterally and parenterally in 1,000 cc. amounts daily. In these cases they noticed a slight drop in the average figure for nitrogenous products. We observed rather sharp rises in the blood N.P.N. and the urea nitrogen until we instituted, as a routine measure, parenteral fluids in 1,000 cc. amounts at twelve hour intervals. Even with these fluids there were consistent rises in blood nitrogen values.

Distention was a frequent complication but the oral administration of acidophilous milk three or four days before induction reduced its incidence. However, if distention became a troublesome factor, constnat suction by means of a duodenal tube was instituted.

We found a rather constant diminution of respiratory excursion, paralleling the

degree of temperature reduction. When respiratory excursion was shallow and when, at the same time, the patient appeared to be in a low metabolic phase, as evidenced by complete cessation of shivering, decreased muscular tension and diminished response to stimulation, the respiratory rate was decreased. Respiratory rate was depressed as low as ten per minute in one instance. At such times the pulse rate likewise was diminished. The lowest pulse rate recorded in this series was 58. During these phases of extremely "quiet hibernation," the respiratory movements were barely discernible, the peripheral pulses could not be appreciated and extremely small amounts of sedative and external ice were necessary to maintain the temperature evenly at 85 and 86 degrees F. This peculiar physiological state does not resemble deep sleep, surgical anesthesia or the coma seen in connection with the usual pathological clinical entities. It is the physiological state to which the term "hibernation" was applied by Smith and Fay. Whether this state is identical with the hibernation of animals has not been established.

When muscular tension and shivering reappeared following the removal of ice, the respiratory rate increased, respiratory excursion deepened and the pulse rate was accelerated. These phenomena would tend to support the conclusions of Swift that metabolic activity is proportional to the amount and intensity of muscular tension and shivering.

There was a consistent increase in hemoglobin percentage and in the number of red and white blood cells. It is known, that following the application of cold to the skin, the cutaneous vessels are constricted to diminish heat loss and the blood is diverted to the deeper parts of the body. It has been suggested that the fluid part of the blood, which is removed from skin vessels, is stored in the muscles and other tissues so that the hemoglobin percentage and the erythrocyte count may be increased. In our series, the increase in white blood cell count was due predominantly to an increase in the number of neutrophiles. In view of these findings it is difficult to attribute the change in the white blood cell picture wholly to concentration. Following the third twenty-four hour period there was decrease in the leucocyte count, which may be due to the effect of lowered temperature on the hematopoietic system.[13,14]

One patient died during the period of hibernation. After twenty-seven hours of temperature below 90 F., the patient died, apparently because of respiratory failure. Death was sudden and without any obvious changes previous to that time. This patient was suffering from recurrent carcinoma of the breast with generalized carcinomatosis. Postmortem examination showed diffuse edema of the brain with involvement of the anterior and posterior lobes of the hypophysis and of the dura mater over the cerebrum by metastatic carcinoma.

The only obvious clinical benefit of any appreciable duration was relief from pain. All patients complaining of pain were relieved in whole or in part following hypothermia, either local or general.

Eleven individuals were successfully hibernated. Of these, three are alive following hibernation—three and one-half, four and one-half, and eight months, respectively. The eight patients who have died since hibernation lived three, three and one-half, three and one-half, five, five, six and one-half, seven and seven and one-half months, respectively.

Whether these figures represent any material prolongation of life expectancy in an average group of far advanced and inoperable cancer patients is difficult to determine. It is not unusual for cancer patients who have reached the stage of metastatic extension to live from three to seven and one-half months.

CASE REPORTS

Case 1. G. C., a white female, aged 36, had a carcinoma of the right ovary with liver and

peritoneal metastases. An exploratory operation was performed but the cancer was in the inoperable stage. Deep *x*-ray therapy was administered and hibernation produced September 15, 1939, and November 15, 1939. Death occurred May 12, 1940. The patient experienced relief from pain and gain in appetite and strength for three months. During this time morphine was reduced from 2 gr. daily to ¼ gr. every two or three days. During two months prior to death pain increased, requiring additional morphine.

Case II. J. L., oriental male, aged 53, had a carcinoma of the prostate with metastases to bone and lung. Deep *x*-ray therapy was given and hibernation produced August 16, 1939. Death occurred on February 26, 1940. There was no noticeable improvement at any time; considerable hematuria was present for three months prior to death; no pain was felt before or after hibernation.

Case III. A. E., white female, aged 65, had a carcinoma of the cervix with metastases throughout pelvis and a rectovaginal fistula. Local cold was applied only by means of applicator to vaginal portion of the cervix and in fistula. The fistula was reduced in size but did not close. There was marked relief from pain. Local cold was begun July 12, 1939. Death occurred April 20, 1940.

Case IV. I. K., white female, aged 42, had a carcinoma of the bladder. Deep *x*-ray was applied and local cold for 384 hours. Hibernation was produced October 12, 1939. Death occurred March 12, 1940. There was relief from pain and dysuria.

Case V. A. L., white female, aged 48, had recurrent carcinoma of the breast with pulmonary metastases. Radical operation was performed and deep *x*-ray given until July, 1939. Local cold was applied for 504 hours and hibernation produced on November 11, 1939. Death occurred May 20, 1940. There was no pain at any time and no evidence of local or general improvement.

Case VI. M. L., white female, aged 41, had a recurrent carcinoma of the breast with metastases to the sternum and ribs. Radical breast operation was performed and deep *x*-ray administered in 1936. Local cold was applied for 504 hours. Hibernation was produced November 19, 1939. The patient is still living. Weight gain and reduction in size of mass in sternum followed hibernation and have been maintained to date.

Case VII. Z. J., white female, aged 49, had a recurrent carcinoma of the breast with pulmonary metastases. Massive *x*-ray therapy was administered over a period of two years. The cancer was inoperable because of extensive scarring and ulceration following *x*-ray. Local cold was applied for 504 hours. Hibernation was produced November 25, 1939. Death occurred May 23, 1940. There was a noticeable relief from pain to time of death.

Case VIII. R. H., white female, aged 46, had a recurrent carcinoma of breast with lung and liver metastases. A radical operation was performed and deep *x*-ray administered in May, 1939. Local cold was applied for 346 hours. There was noticeable but not complete relief from pain. The patient died November 23, 1940.

Case IX. W. D., white female, aged 33, had recurrent carcinoma of the rectum with metastases to inguinal glands, perineum and liver. Radical abdominoperineal operation was performed and deep *x*-ray administered. Local cold was applied for 236 hours and hibernation produced January 9, 1940. Death occurred April 27, 1940. Relief from pain to six weeks prior to death was noticed.

Case X. T. L., white male, aged 53, had a bronchogenic carcinoma. Deep *x*-ray was administered ending in August, 1939. Hibernation was produced January 16, 1940. Death occurred April 23, 1940. No pain was present at any time; but there was an annoying cough that showed no change following hibernation.

Case XI. M. J., white female, aged 42, had a recurrent carcinoma of the breast with generalized carcinomatosis. A radical operation was performed and deep *x*-ray administered. Hibernation was produced February 27, 1940, but the patient died during hibernation.

Case XII. E. Q., white female, aged 52, had a carcinoma of right heel with metastases to the groin. Leg amputation with block gland dissection was done and *x*-ray administered. Hibernation was produced April 1, 1940. Her general condition is good with no evidence of recurrence to date.

Case XIII. P. D., white male, aged 47, had a carcinoma of stomach with metastases to the liver and peritoneum and ascites. An exploratory operation was performed but the cancer was in the inoperable stage. Deep *x*-ray was administered February, 1940. Hibernation was produced March 26, 1940. Death occurred June

25, 1940. There was noticeable but not complete relief from pain.

Case XIV. C. B., white female, aged 49, had a carcinoma of the cervix with pelvic metastases. Radium and deep *x*-ray were administered; there was no pain at any time. Hibernation was produced March 5, 1940. This patient is now markedly cachectic and has had repeated hemorrhages. No reduction in size of palpable portion of growth.

SUMMARY

1. Fourteen patients with inoperable and far advanced cancers were subjected to local and general hypothermia. The lowest general temperature obtained was 77.6 degrees F.

2. The periods of general hypothermia varied from thirty-six and one-half hours to 120 hours. Periods of local temperature reduction ranged from 236 hours to 792 hours.

3. Twelve individuals were submitted to hibernation. One death occurred during hibernation, apparently because of cerebral edema superimposed on meningeal metastases. Eight deaths occurred three months to seven and one-half months following hibernation. Three patients are living three and one-half, four and one-half and eight months following hibernation. Two patients received only local cold; one lived one month; one lived nine months.

4. All patients complaining of pain were relieved in whole or in part following hypothermia, either local or general.

BIBLIOGRAPHY

1. Fay, T. and Henny, G. C. Correlation of body segmental temperature and its relation to the location of carcinomatous metastasis. *Surg., Gynec. & Obst.*, 66: 512, 1938.
2. Smith, L. W. and Fay, T. Temperature factors in cancer and embryonal cell growth. *J. A. M. A.*, 113: 653, 1939.
3. Klinke, J. The use of freezing temperatures in experimental tumor research. *Ztschr. f. Krebsforsch.*, 48: 400, 1939.
4. Britton, S. W. Extreme hypothermia in various animals and in man. *Canad. M. A. J.*, 22: 257, 1930.
5. Troedsson, B. S. Experimental lowering of body temperature of rabbits and its possible application in man. *Arch. Phys. Therapy*, 20: 501, 1939.
6. Swift, R. W. The effects of low environmental temperature upon metabolism; technic and respiratory quotient. *J. Nutrition*, 5: 213, 1932.
7. Zondek. Quoted from Bazett, H. C. Principles and Practice of Physical Therapy, vol. 1, chap. iv. Hagerstown, Md., 1936. W. F. Prior Co.
8. Harkins, H. N. and Harmon, P. H. Experimental freezing: bleeding volume, general and local temperature changes. *Proc. Soc. Exper. Biol. & Med.*, 32: 1142, 1935.
9. Kohn-Richards, R. and Grimes, C. Detoxification of barbiturates and influence of method of administration. *Anesth. & Analg.*, 18: 139, 1939.
10. Swift, R. W. The effects of low environmental temperature upon metabolism; influence of shivering, subcutaneous fat and skin temperature on heat production. *J. Nutrition*, 5: 227, 1932.
11. Suomalainen, P. Production of artificial hibernation. *Nature, London*, 142: 1157, 1938.
12. Finney, Dworkin Cassidy. Quoted from Britton.[4]
13. Huggins, C. and Blocksom, B. H., Jr. Changes in outlying bonemarrow accompanying a local increase of temperature within physiological limits. *J. Exper. Med.*, 64: 253, 1936.
14. Huggins, C. and Noonan, W. J. An increase in reticuloendothelial cells in outlying bonemarrow consequent upon a local increase in temperature. *J. Exper. Med.*, 64: 275, 1936.
15. Smith, L. W. and Fay, T. Observations on human beings with cancer maintained at reduced temperatures of 75 to 90 degrees F. *Am. J. Clin. Path.*, 10: 1, 1940.
16. Vaughn, Arkell M. Experimental hibernation of metastatic growths. *J. A. M. A.*, 114: 2293, 1940.

PERIDURAL ANESTHESIA: A CONSIDERATION OF 1000 CASES

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SINCE a preliminary report by one of us (J. R. H.) in 1934[1] we have continued to use peridural anesthesia, making a careful survey of its advantages and disadvantages. To date 800 cases have been operated upon under peridural anesthesia; they include practically the entire range of surgery from the clavicle to the feet.

Every experienced surgeon seeks three factors in the anesthetic he employs: safety, effectiveness and simplicity of application. While no single anesthetic fulfils every requirement, we believe that the peridural method more nearly approaches the ideal.

A perusal of the literature reveals some interesting facts concerning peridural anesthesia. Corning,[2] in 1885, called attention to the possibilities of obtaining anesthesia by the subdural application of cocaine. In 1901, Cathelin[3] in a series of articles described the perisacral method and demonstrated that extensive anesthesia could be produced by placing the preparation outside the dura. He proved that the dura was impervious to the anesthetic solution and, therefore, there was no danger of direct action on the cord structures. He showed that fluids when injected into the sacral canal rise by capillary action in the peridural space to a height in direct proportion to the amount of the preparation used and the speed with which it was forced into the canal. Cathelin found experimentally that the peridural space had an extreme tolerance, and that more than a liter of fluid could be injected into the spinal canal of an average sized dog. He further showed that when sufficient cocaine solution was injected into the sacral canal of the dog, it resulted in complete anesthesia of the entire body. Though Cathelin's method met with very little success in the earlier years, recently it has been quite generally employed.

Pagés,[4] in 1920, was the first to make use of the peridural space in the lumbar and thoracic regions for obtaining anesthesia in abdominal and chest surgery. In his first few cases of peridural anesthesia he used concentrations of 1:100 for novocain, believing that the anesthesia was mainly one of the nerve conduction of the spinal pairs and that these were surrounded by a dural prolongation. While the results were satisfactory, he soon found that a solution of 2:100 was much better.

Following Pagés' report in 1921, the method was tried by many surgeons in France, Italy and the South American countries. In 1933, Gutierrez and Rubido[5] reported the use of peridural anesthesia in over 3,000 cases, with some failures but no fatalities. They confirmed the advantages claimed by Pagés. They used a 2 per cent novocain solution to which 1 cc. of a 1:1000 adrenalin solution was added.

Dogliotti,[6] in 1933, reported on the use of peridural anesthesia in 300 cases. He considered the method superior to local anesthesia "since it acts both on the superficial

and deeper layers and viscera so that any operation is possible by its use. Anesthesia is moreover so deep that it can only be compared with that obtainable from an ordinary spinal anesthetic. Peridural anesthesia also possesses the advantage, when compared with local anesthesia, of causing no interference to the local nutrition of the tissues. It thus has no delaying effect or hindrance in the course of healing. When compared with general anesthesia it will be seen to possess all the advantages and disadvantages of local and block anesthesia." His excellent article should be studied by all who attempt to obtain anesthesia by the peridural route.

Hess,[7] in 1934, reported seventy-five cases operated upon under peridural anesthesia. He listed as its advantages no shock, no disturbance of the lungs, heart, liver, gastrointestinal tract, and no effect on damaged renal tissue. He noted no postoperative complications. It was his belief that although it is the safest of all types of anesthetics, peridural anesthesia should not be used routinely.

Bogetti[8] reported satisfactory results in 90 per cent of his cases in 1934. He emphasized the absence of dyspnea, headaches, nausea and vomiting. Deformities of the spine, calcification of the ligaments, and errors in technic were responsible for the failures. He was of the opinion that its use was contraindicated in serious cases of advanced heart, lung and kidney disease. He used adrenalin freely, and found that his best results were obtained when he used 50 cc. of the anesthetic solution injected at levels from the eleventh dorsal to the fifth lumbar spaces, depending on the type and location of the operation. He found the duration of anesthesia to be ninety to one hundred twenty minutes.

Sammartini[9] used from 35 to 60 cc. of the solution in the lumbar spaces. From seven to thirty minutes were required to obtain anesthesia. He noted that the pulse changes were slight and the blood pressure changes insignificant. He called attention to one noteworthy fact which we have found present in 100 per cent of our cases, that with complete sensory paralysis the motor function was still intact. Relaxation was excellent and the anesthesia extended from the chin to the ankles. Nausea was present in about 3 per cent of his cases.

Bertola and Sala,[10] reporting in detail on their work in 1935, called attention to the simplicity of the equipment needed to give the anesthetic and to the minimal of postoperative complications. They considered the method about ideal. They used 20 to 50 cc. of a 2 per cent solution of novocain and found that the anesthesia lasted longer than any other type of nerve block. They did not inject above the tenth dorsal space. They noted that the arterial tension and motor functions were maintained even though the anesthesia lasted from ninety to one hundred twenty minutes.

Babbini[11] reported on the use of peridural anesthesia in seventy-nine cases up to 1935; in sixty-five the results were very good, in four they were good, and in six not satisfactory. He used 20 minims of adrenalin in each 100 cc. of solution and obtained his best results when he injected 50 cc.

Sievers[12] found peridural anesthesia satisfactory in kidney and ureteral work, and particularly in cystoscopy in children. Caporale[13] also used it in kidney and ureteral cases, reporting on 300 cases in 1936. He injected 2.5 per cent solution into the eighth to the eleventh dorsal spaces. Like many other workers, he recognized the negative pressure in the peridural space. He used a type of manometer so that when the needle entered the triangular space the fluid in the manometer moved toward the needle, thus indicating that the needle point was properly placed. Caporale recommended injecting 10 cc., waiting three or four minutes and then injecting another 10 cc., again waiting and finally injecting 10 or 20 cc. He reported no postoperative complications.

Ruiz[14] and his associates at the clinic of Professor Alberto Gutiérrez employed peridural anesthesia in 3,826 cases from

1932 to 1939. He reports two serious accidents caused by the anesthetic and three fatal cases in which it is certain that death was not caused by anesthesia, though no necropsies were done.

The patients in this series varied in age from fifteen to seventy-eight years; they underwent a variety of operations, such as gastrectomy, gastroenterostomy, resection of the intestine, abdominoperineal procedures, appendectomy, herniorrhaphy, cholecystectomy, cholecystostomy, operations for cysts of the liver, nephrocolopexy, nephrostomy, nephrectomy, operations for retroperitoneal tumors, Albee operations with costal graft, osteotomy, amputation, and extirpations of the mammary gland including the pectoral muscles and axillary glands.

Their conclusions are interesting: "It is admitted that peridural anesthesia is not perfect, inasmuch as there is some risk attached to its use, but it is equally undeniable that, so far, it seems to be superior to the method of anesthesia commonly used. It is safer than spinal anesthesia because it has all the advantages of that method and none of its disadvantages (bulbar accidents, cephalea, rachialgia, paralysis, vomiting, etc.). It is better than anesthesia with ether or chloroform because it is much less toxic, it may be used in cases when ether or chloroform are contraindicated; it may be repeated without furthur inconvenience and the postoperative stage is excellent. Local anesthesia is less toxic, but it cannot be used for nervous high-strung patients; it requires greater anatomic skill on the part of the surgeon and a very accurate diagnosis to avoid exploratory maneuvers, and it takes much time—a serious drawback. Pagés' peridural anesthesia represents real progress in surgery."

TECHNIC

The fundamental principles of technic do not differ from those laid down by Cathelin[1] thirty-five years ago. We have modified some of the details of technic and enlarged the scope of its usefulness. Our procedure is as follows:

Premedication. Most surgeons favor some form of premedication with all types of anesthesia, except possibly in small children. We have found that morphine with or without scopolamine or atropine in doses to suit the individual patient has been quite satisfactory.

Position of the Patient. The anesthetic is given while the patient is lying in the lateral prone position, and he remains on his back with the table level during the operation, or in any position required for the given operation. No attempt is made to influence the extension or spread of the anesthetic by changing the position of the patient.

Control of the Patient. The patient should understand what the operator wishes to accomplish. With proper technic and sufficient time for the anesthetic solution to take effect, success will be obtained. A competent assistant who can divert the patient's attention and offer reassurance is very valuable in some cases but not essential.

Equipment. The apparatus required for administering peridural anesthesia is quite simple. We have on the table a 2 cc. and a 10 or 20 cc. syringe, with a fine hypodermic needle about 3 cm. in length, and a relatively fine spinal needle with a short beveled point, and two medicine glasses. The ordinary hypodermic syringe is used to anesthetize the point of spinal puncture. One medicine glass is for normal salt solution which we frequently use although it is not essential. The second one contains the anesthetic solution. We have used in most of our work a 2 per cent solution of novocain or procaine in normal salt.

Procedure. The point of insertion of the spinal needle in all cases has been as near the midline as possible. The level at which the needle is placed is controlled, in great part, by the type of operation contemplated. For all pelvic, perineal, and lower extremity work we select the second to the fourth lumbar interspace. For upper

abdominal work the peridural space is entered at about the ninth dorsal to the first lumbar interspace, while for chest operations we place the needle in the peridural space in the middorsal region.

With the insertion of the spinal needle one obtains a sensation of release as the needle passes the deep margin of the interspinous ligament and enters the peridural space. When this sensation is noted, we withdraw the stilet and look for the spinal fluid. The needle may be rotated and the syringe attached in an attempt to obtain spinal fluid. If no fluid is seen or we have a dry tap, we know the needle has not entered the dura. If spinal fluid is secured, we have in most cases withdrawn the needle and repeated the puncture one segment higher or lower. Odom[15] recommends inserting the needle until spinal fluid is found and then withdrawing it until the fluid no longer escapes. This we do not advise as it removes one of our safeguards.

When we believe that the needle is in the proper space we attempt to inject normal salt solution. If, perchance, the needle is still in the interspinous ligament, no solution can be forced in except by great pressure on the plunger. If this be true, with the syringe still attached, the needle is then rested a little deeper; and when the triangular peridural space is reached, a negative pressure will be noted and the fluid enters almost with a suction. In either instance, when the point of the needle is in the peridural space, the salt solution or the anesthetic solution may be injected with the slightest pressure on the plunger. At this time 5 to 7 cc. of the 2 per cent novocain solution are injected, the syringe removed and the stilet replaced in the needle. We wait five minutes, the time being carefully noted by the nurse. The patient is then asked to move his feet and to respond to the needle prick in the buttocks. If the response is positive in both instances, it is evidence that the anesthetic solution rests outside the dura, otherwise the patient would have a complete anesthesia and his response would be negative. (On three occasions this has happened and the operation was carried out satisfactorily without further injection of the anesthetic.) At this point, if a drug reaction is noted, no further solution should be injected.

With a positive response another 40 to 45 cc. of the solution are injected slowly, making frequent inquiries as to the patient's sensations and well being. The spinal needle is then withdrawn and the patient asked to turn on his back, which he invariably does without assistance. The next ten minutes are consumed in the preparation of the operative field. At the end of this time the anesthesia is usually complete. In some cases a longer interval is required. With the same technic an occasional case will require fifteen to twenty-five minutes for complete anesthesia.

The Use of Adrenalin. In our early work we used 5 to 10 minims of adrenalin as a routine. We found in some cases that it increased the excitability of the patient. Any patient entering the operating room in a conscious condition will have sufficient nervous reaction to produce an increase of his own adrenalin secretion, which is in excess of his needs; therefore, by injecting 5 to 10 minims of adrenalin hypodermically we found in some cases that it produced what we have termed a hyperadrenalism with definite nervous manifestations. During the last five years we have reserved the use of adrenalin for those cases in which the blood pressure falls relatively out of proportion to the patient's well being, or in which psychic shock or drug reactions are severe. In most cases it restores the blood pressure and pulse in a few minutes. Coramine has been used in a few instances and in less than one in one hundred oxygen and carbon dioxide have been resorted to because of slow shallow respirations. In the last 400 cases we have had no serious reactions.

ANESTHETIC EFFECTS

A mental survey of the spinal canal will show one that there is no other exit for

the anesthetic solution except through the intravertebral notches once it is placed in the spinal canal outside of the dura. While

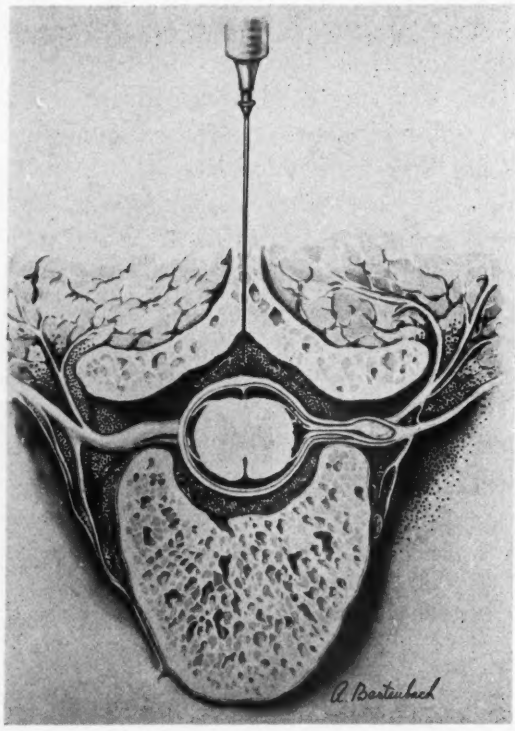

Fig. 1. Semidiagrammatic section through lower dorsal region. Relative size and outline of the peridural space is shown. Needle point rests in the triangular space, which is more pronounced in the lumbar region. The nerve roots are shown beyond the dural sheath with their communicating branches to the sympathetic ganglion on the right. Stippling shows how the anesthetic solution bathes the nerve roots, the communicating branches and the sympathetic trunks.

passing through the intravertebral notches, the line of least resistance is following the nerve roots that are no longer covered with the dura mater, and in close proximity to the roots are the communicating branches to the spinal sympathetic ganglion, all of which are bathed in the solution. (Fig. 1.)

When 50 cc. of a colored solution were injected into the peridural space of a cadaver, it was found coming through from six to ten intravertebral notches. When 50 cc. of a 2 per cent novocain solution in normal salt are injected into the lower dorsal or lumbar peridural space of the patient and sufficient time has elapsed, usually ten to fifteen minutes after injections, complete sensory anesthesia develops and a vasomotor constriction is noticed. The motor function is affected only in part.

We have recorded relatively few complete failures in our work. In each of these a careful review of the various factors involved has revealed imperfect technic. In two cases spinal curvature caused the needle to find its way into the wrong location; in three others spinal bony changes made it impossible to place the needle properly and this type of anesthesia was abandoned in favor of a general anesthetic. The loss of sensation extended from the nipples to the knees in all cases in which anesthesia has been obtained, and in many cases it extended from the clavicle to the toes. The motor functions were never lost completely. It is interesting to note that the patient can move his feet throughout the operative procedure and in many cases will move himself from the table to the cart following operation.

Throughout the operation the color of the skin about the anesthetized field remains good and capillary bleeding is notably absent. Respirations are slow and quiet and there is an entire absence of that churning motion of the viscera in the upper abdomen that is so objectionable under general anesthesia. Abdominal muscular relaxation is extreme and this facilitates exploration and study of intraperitoneal pathology as no other anesthetic will do. The small intestines are contracted. Manipulation of the abdominal viscera and all operative procedures are made so easy that the use of lap pads is reduced to a minimum. Rarely are any of the peritoneal contents forced into or through the operative wound. Closure of the abdominal incision is done with the greatest ease. Nausea during or after operation rarely occurs, and vomiting in not more than 2 or 3 per cent at any time.

SYSTEMATIC REACTIONS

Idiosyncrasy to drugs is a surgical problem not yet solved. That some patients

react adversely to novocain and other preparations is quite evident. We have experienced no little difficulty in differentiating drug reactions, psychic and nervous shock, hypo- and hyperadrenalism, and toxic shock. Every surgeon of experience has noted these various reactions even during minor surgical work under local anesthesia. We find the psychic reactions are usually transient and pass off in a few moments, but in some cases they lead to the more serious condition of real anatomical shock. Drug reactions are more persistent and difficult to handle.

Disturbances due to adrenal imbalance, especially the hypophase, frequently respond readily to treatment, and after our discontinuance of the use of adrenalin as a routine the hyperphase rarely occurs. In the hypoadrenal condition with an extensive fall in blood pressure, ten to fifteen minims of adrenalin usually control the situation promptly. Rarely a case will not respond. During the past year we have given these patients neosynephrin with very prompt response. In psychic shock the decrease in the effective circulating volume of blood is apparently brought about, for the most part, by greatly increased vascular capacity. It seems that the vasoconstrictor center is inhibited or the vasodilators stimulated. However, this type of nervous shock is of brief duration.

Concerning the circulatory system, vascular tension is a very important factor with all types of anesthesia and should be maintained within certain limits. All patients show some variations in their blood pressure while under anesthesia and this is true of the peridural type. In a few cases there was a temporary rise which we interpreted as a psychic stimulation of the patient's own adrenals. We have found that 25 per cent of patients will show a drop of several points in blood pressure, about 10 per cent, to a level at which adrenalin is indicated, and in 1 per cent a state of severe shock may result. In 75 per cent of the cases the blood pressure is affected so mildly that we no longer consider it carefully, except in those cases in which the respiration becomes shallow and the pulse quite small. The pulse rate remains within normal in all cases that are without psychic reactions, while the quality of the pulse varies with the blood pressure.

SERIOUS REACTIONS

We have experienced but few serious reactions. In six patients the blood pressure dropped to a point at which no reading was possible, but the heart continued at a rate of 50 to 60; there was a temporary suspension of respiration after it had receded to five or six per minute. In each of these cases artificial stimulation of respiration and the use of adrenalin restored a normal condition in from five to fifteen minutes. In two patients, after several minutes, we abandoned operation; one of these patients suffering from a gunshot wound of the abdomen, had been refused operation a few hours before because of shock. The other, a negro, aged 34, with an inguinal hernia, demonstrated what we interpreted as a drug idiosyncrasy. He was given adrenalin, and artificial respiration was administered for about twenty minutes. He was operated upon the following day under general anesthesia with satisfactory results.

Three cases in which obverse reactions occurred in spinal anesthesia after an injection of 5 cc. were: a 68 year old man, with chronic cholelithiasis and several large stones in the common duct, another, a man of 66 years, with a similar gallbladder condition, and the third, a woman, aged 38, with chronic cholecystitis. In each it was found that a mistake had been made in the location of the needle and after the regulation five minutes the patient was unable to move the feet, and a needle prick in the buttocks demonstrated loss of sensation. Each was operated upon under a very satisfactory spinal anesthesia with an uneventful recovery.

No operator can hope to be 100 per cent perfect in placing the needle in the peridural space; however, with the careful technic described, the hazards of this type

of anesthesia are reduced almost to the vanishing point.

What were apparent failures in our early work we later found were due to our inexperience, the use of a 1 per cent solution, and not allowing sufficient time for anesthesia to develop. We now know that when the solution is properly placed and a 2 per cent solution used, anesthesia will be obtained in every case. Occasionally a longer time than fifteen minutes will be required before anesthesia is complete. Every failure to obtain anesthesia of some degree has been found to be due to an error in technic.

CONTRAINDICATIONS

We have intentionally avoided the very bad risk cases. Experience has revealed that it is unwise to use this type of anesthesia in severe sepsis, prolonged toxemias, especially intestinal obstruction of long standing, stomach cases with dehydration and inanition. We have not had the temerity to use it in marked hypotension. While we do not believe that hypertension is in any sense a contraindication, we have seen a few cases of hypertension in which the pressure was elevated several points while under the influence of peridural anesthesia. The experienced operator is the best judge of how a given case will respond to an anesthetic, and it is his responsibility to have administered the anesthetic best adapted to the patient.

POSTOPERATIVE COURSE

The patient is returned to his bed, placed in a normal, comfortable position and given water immediately. At times water is given before the patient leaves the operating room. A generous diet may be allowed early, for there is an entire absence of nausea and vomiting. There is no headache or backache, and wound pain is reduced to a minimum. It is rare to encounter urinary retention. Recovery is more comfortable than with any other type of anesthesia known to the authors, with the possible exception of local. Spinal cord injury, bulbar paralysis and puncture of the nucleus pulposus should not occur in peridural anesthesia. The central nervous system cannot be affected when the solution is placed in the peridural space, as all the anesthetic effects take place in the peripheral nerves.

COMMENT

The 1000 patients operated upon under peridural anesthesia cover practically the entire range of surgical operations below the clavicle. To date we have had no fatalities from the anesthetic. The relative simplicity and the wide margin of safety in the hands of the average operator should encourage more general use of peridural anesthesia.

SUMMARY

1. This report is based on the use of peridural anesthesia in 1000 personally supervised cases.

2. The current literature contains reports of its use in several thousands, with but two deaths and a few serious reactions recorded.

3. The absence of postoperative complications shortens the hospital stay and hastens convalescence.

4. The minimum cost, the few instruments required, and the ability to carry on without a trained anesthetist have an economic value, especially in small hospitals and in rural districts.

REFERENCES

1. Harger, John R. Peridural anesthesia in abdominal surgery. *Illinois M. J.*, 65: 317, 1934.
2. Corning, J. Leonard. *New York M. J.*, 42: 483, 1885.
3. Cathelin, F. Technique de la ponction du canal sacre pour aborder la voie epidurale. Srs avantages au laboratorie. *Compt. rend. soc. de Biol., Paris*, vol. 53, 1901.
4. Pagés, Fidel. Metameric anesthesia. *Rev. de san. militar.*, 11: 351–385, 1921.
5. Gutierrez, A. and Rubido, Lopez M. Results obtained by peridural anesthesia. *Rev. de cir. de Buenos Aires*, 12: 93, 1933.
6. Dogliotti, A. M. Segmental peridural spinal anesthesia. *Am. J. Surg.*, 20: 107, 1933.
7. Hess, Elmer. Epidural anesthesia in urology. *J. Urol.*, 31: 621, 1934.
8. Bogetti, M. Peridural anesthesia in surgery of the biliary tract. *Arch. edattid. Soc. Ital. di Chir.*, 40: 669–672, 1934.

9. SAMMARTINI, E. S. Peridural anesthesia in emergency surgery. *Rev. de cir. de Buenos Aires*, 13: 635, 1934.
10. BERTOLA and SALA, T. Peridural anesthesia according to Pagés and Dogliotti. *Perensa medica Argentina*, 22: 2222–2229, 1935.
11. BABBINI, R. Peridural anesthesia, Pagés' technique. *Rev. Argent. de Neurol. y Porquit*, 1: 307, 1935.
12. SIEVERS, R. Über die Verwendung der Peridural-anästhesie beim Kinde, insbesondere für die Cystoskopie. *Arch. f. klin. Chir.*, 185: 359–369, 1936.
13. CAPORALE, L. Peridural anesthesia in renal surgery. *J. Urol.*, 35: 403–408, 1936.
14. RUIZ, VINCENTE. Pagés peridural anesthesia. Report of 3,826 cases. *Minnesota Med.*, 22: 363, 1939.
15. ODOM, C. B. Review of Pagés' epidural anesthesia. *New Orleans M. J.*, 88: 618, 1936; also Epidural anesthesia. *Am. J. Surg.*, 34: 403, 1936.

Correction: In "Operations Fifty Years Ago," by R. Matas, which appeared in the January issue of the Journal, 51: 47, column 1, lines 19–23, the word *bead* should be substituted for *band*. The words of Guerin to the Pope should read, "I shall be very careful, your Holiness, when I return to France, to let no one know that my head has rested on your breast, for if I did, they would soon cut off my ears to make relics of them."

A MODIFIED PORRO OPERATION*

IRVING W. POTTER, M.D., F.A.C.S. AND MILTON G. POTTER, M.D., F.A.C.S.
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DURING the past few years, many articles have appeared in the literature concerning the Porro cesarean section, which is a cesarean section followed by a suprapubic hysterectomy. This procedure has considerably lessened maternal mortality, particularly in those disasterous cases of sepsis and hemorrhage.

For the past ten years, it has been our custom, when the occasion arose, to alter the above mentioned procedure by removing the uterus with the enclosed fetus. This departure from the accepted Porro cesarean appears to us to have many advantages. The most important are the lack of spill from the incised uterus in cases of infection and the minimum blood loss, particularly when profuse bleeding occurs. It should be the operation of choice by the trained operative obstetrician and we believe, when it is better understood, will be resorted to in preference to the present Porro cesarean.

In this paper, it is our purpose to review very briefly the early history of the Porro cesarean operation, to describe the operation as we do it and to report the results obtained in 233 cases.

Cesarean section followed by supravaginal hysterectomy has been practised for many years. Cavallini, in 1768, suggested this operation, and it was performed successfully on rabbits in 1823. Storer, of Boston, did it in 1869 for fibroids but not with success. In 1877, Porro advised the amputation of the body of the uterus and adnexa above an elastic ligature placed about the cervix, and the stump was then secured in the abdominal wall. For a succeeding number of years, isolated cases were reported with various modifications of the original procedure.

In order to study better the original procedure and its modifications, Harris of Pittsburgh, years ago, suggested the following classifications:

1. *True Porro Cesarean Section* in which the cesarean was done as a first stage and the stump of the cervix secured in the abdominal wall.
2. *Modified Porro Cesarean Section* similar to the above operation with the pedicle dropped back into the abdomen.
3. *Porro Mueller Operation* during which the uterus was eventrated, a wire constrictor placed around the cervix, the uterus opened, the contents removed and the stump secured as in the original Porro.
4. *Modified Porro Mueller Operation* with the pedicle dropped back into the abdomen.

In 1890, Dr. J. F. Baldwin, of Columbus, Ohio, was the first to perform this operation in Ohio and the ninth in this country. Dr. L. E. Pfaneuf, of Boston, Massachusetts, in 1931, reported twenty-five cases without a maternal death.

DeCourcy, in 1930, described a bloodless modification in which, contrary to the original Porro or the Porro Mueller operation, the blood supply to the uterus is cut off *before* making the uterine incision and the gestation sac is delivered intact.

The procedure we wish to describe is somewhat similar to that of DeCourcy, in that the blood supply to the uterus is ligated *before* delivery of the baby. However, it differs in that the uterus is not opened until it is removed from the abdomen and then by an assistant at another table the baby is delivered.

This operation is simple in technic, quickly performed, less sloppy and less dangerous than the cesarean section followed by hysterectomy, because it lessens loss of blood, causes little shock and prevents gross contamination of the peritoneal cavity when infectious material is present.

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A study of the hemoglobin, blood count and blood pressure is always made before the operation and transfusions freely given when indicated.

assistant pushes the intestines out of the way and protects them by means of large hot packs. A large curved DeLee retractor is held in place at the lower angle of the

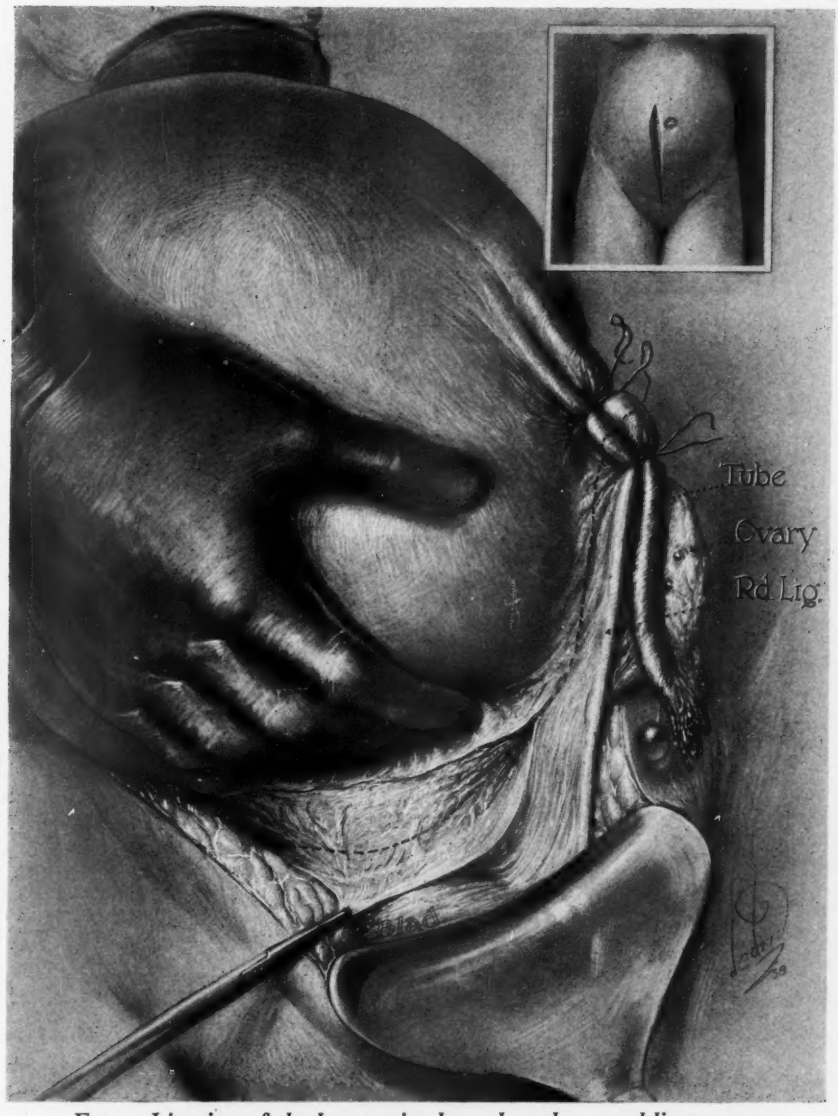

Fig. 1. Ligation of the large veins lateral to the round ligament.

After the bladder has been emptied and a long midline incision has been carried well down toward the symphysis, the abdomen is opened. The bleeding is controlled in the fascia by ligatures and then the peritoneum is opened. At this time, the head of the operating table is lowered and the abdomen is carefully explored for adhesions of the intestine and omentum to the body of the uterus. If present, these are freed and the operator then lifts the uterus up through the abdominal opening and his incision so that the operator has a clear view of the anterior surface of the lower uterine segment.

The head of the fetus is lifted up out of the lower uterine segment and the entire uterus is held up by the assistant. With the head of the fetus still dislodged from the lower uterine segment, the operator ligates the large veins lateral to each round ligament, which he also includes if possible in his ligature. This suture is anchored to the round ligament to prevent slipping and also

acts as a lateral boundary beyond which the operator does not pass. (Fig. 1.)

The assistant, at this time, still has the fetal head dislodged and while holding up the uterus, he approximates by pressure of his fingers the anterior and posterior walls of the lower uterine segment in order to facilitate the placing of the curved Kelly clamps. (Fig. 2.) The peritoneal bladder fold is dissected down and the uterus is amputated. (Fig. 3.)

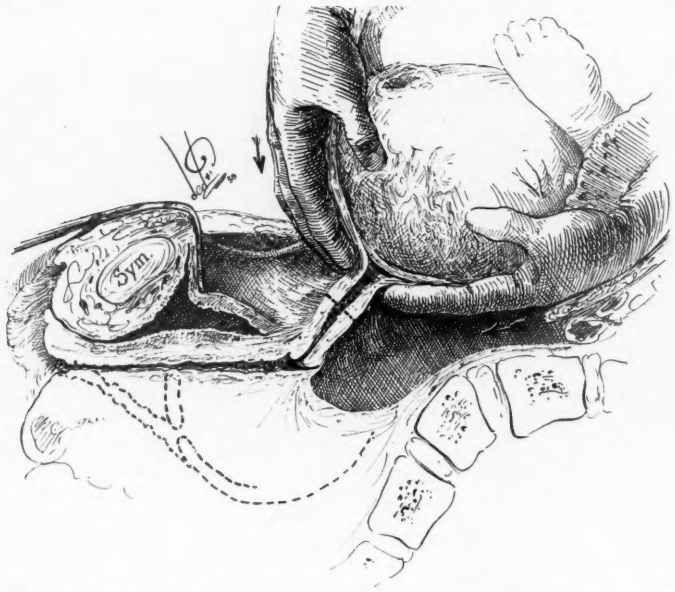

Fig. 2. Approximation of the anterior and posterior walls of the lower uterine segment.

We have found by taking smaller bites with our clamps there is less chance of their slipping and the Kocher clamps are much to be preferred in the vicinity of the cervix.

After the uterus is freed, it is handed to an assistant who at a side table, incises it, removes the child and cuts the cord. (Fig. 4.)

As a general rule approximately fifteen minutes elapse from the time the uterine blood supply is cut off until the child is removed from the uterus.

The fact that we can deliver live babies (if we have viable ones at the start of the operation) after the blood supply has been stopped for such a length of time, astounds our visitors. However, it is just another demonstration that undue haste in operative obstetrics is not always necessary in order to obtain live babies.

The uterine arteries are ligated and all other vessels, the cervix and surrounding incised tissue are sutered with continuous chromic No. 2 catgut. A gauze drain can be inserted in the cervix if desired.

The round ligaments are anchored to the cervical stump and the stump peritonealized by anchoring the peritoneal bladder fold to the posterior aspect of the cervical stump. (Fig. 5.) The abdominal incision is then closed with chromic No. 2 catgut throughout and through-and-through retaining silkworm when necessary.

We always attempt to save one or both ovaries when possible and ordinarily there is enough endometrial tissue left in the stump so that the patient has some bloody showing each month. This occurrence seems to have a good psychic effect on the patient and is desirable.

We have also had the unexplainable experience of removing both ovaries in this type of operation and still have the patient report occasional bloody showing with no appreciable gain in weight and no menopasual symptoms.

We have learned from experience, when this operation is done for extreme bleeding from a centrally implanted placenta praevia, that it is advisable to explore thoroughly the cervical stump from above and

below, for very often a piece of placenta may be left in the cervix. One such incident occurred in this series and it was not discovered until the patient was practically exsanguinated on the fourth postoperative day. The portion of placenta was removed and the cervical stump packed from below. The patient was given blood transfusions immediately and fortunately recovered.

We believe this is a life saving procedure and should be a part of every trained obstetrician's armamentarium even though the occasion for its use is rare.

This operation has a definite place in the treatment of frankly infected undelivered women. It also has a place in the treatment of those occasional patients, who are brought into the hospital shocked and practically exsanguinated; and we have found from experience after these patients are treated for shock and receive blood transfusions and when the lower uterine

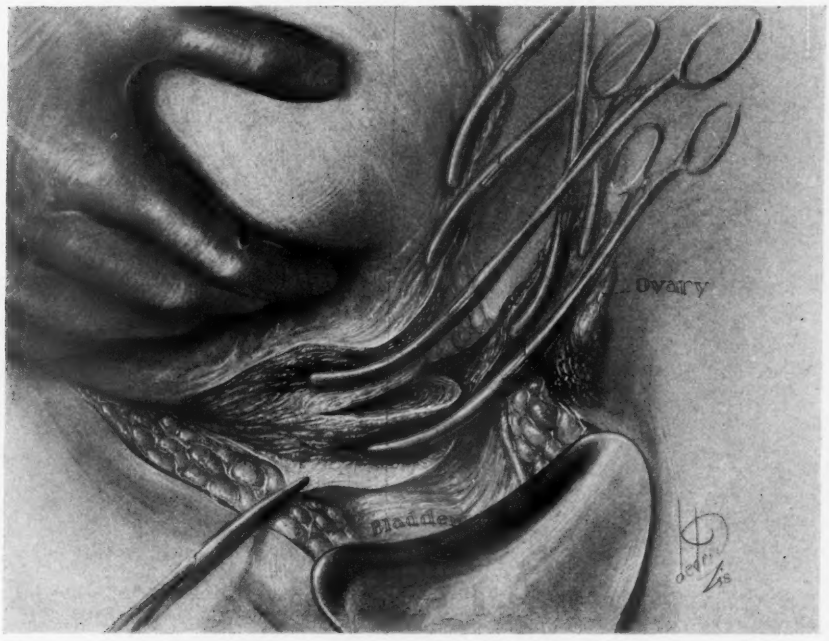

Fig. 3. Amputation of uterus after peritoneal bladder fold has been dissected from the lower uterine segment.

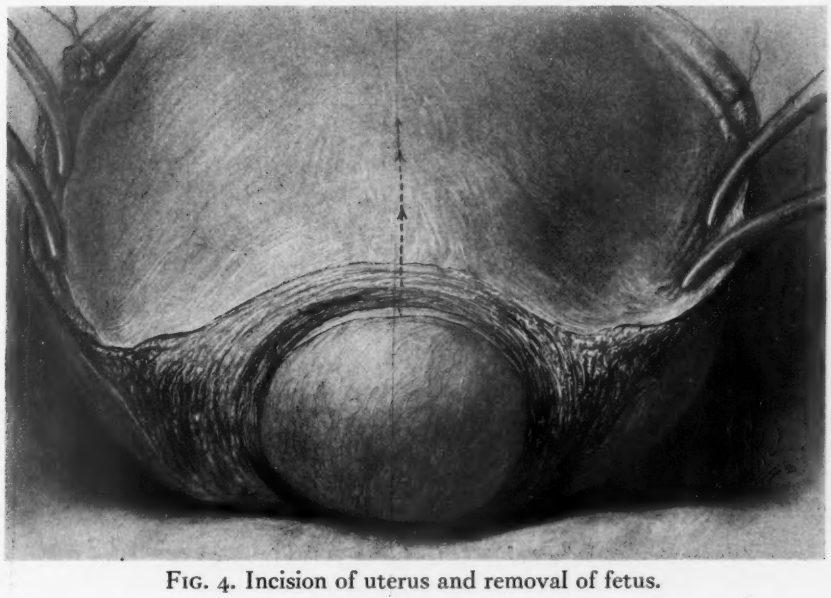

Fig. 4. Incision of uterus and removal of fetus.

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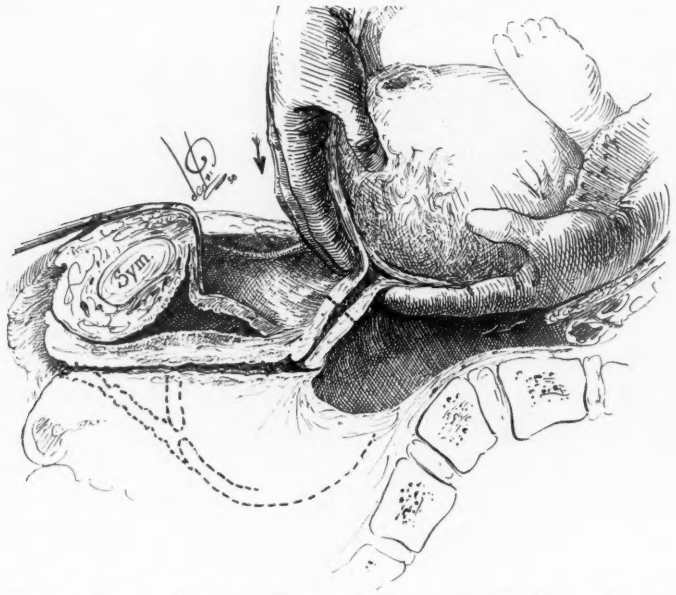

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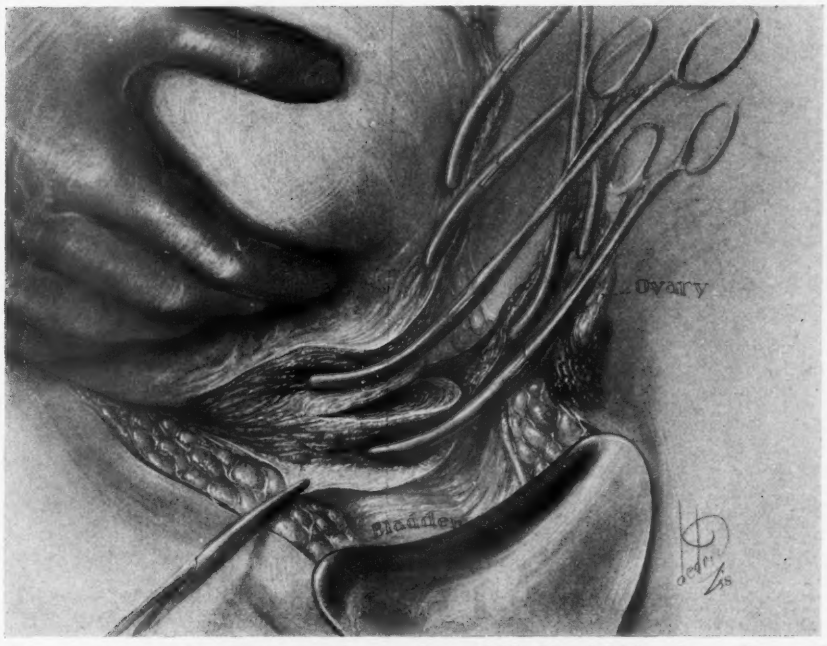

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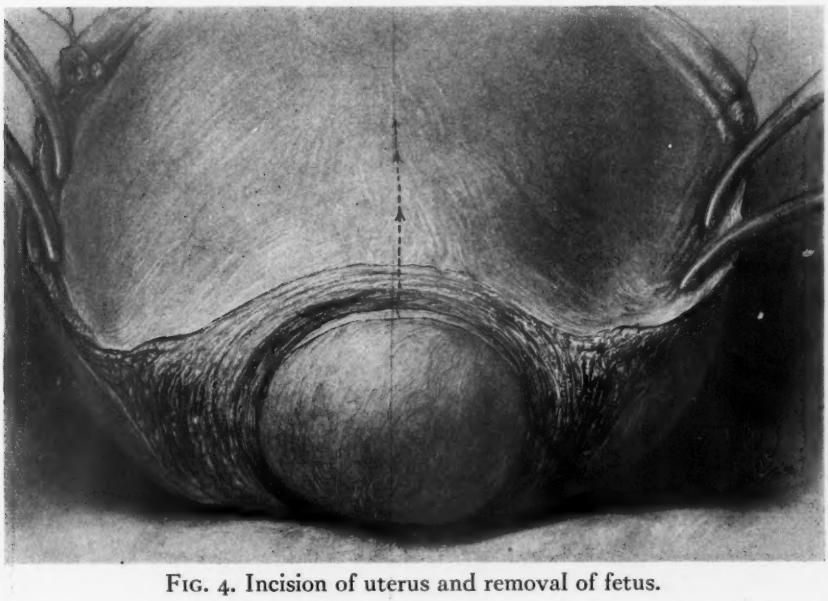

Fig. 4. Incision of uterus and removal of fetus.

segment is not effaced or the external os dilated, they do very much better with this type of procedure than they do with a cesarean section followed by a hysterectomy. Our experience with both types of operation has been rather extensive and the lack of shock in the operation as described is most noticeable.

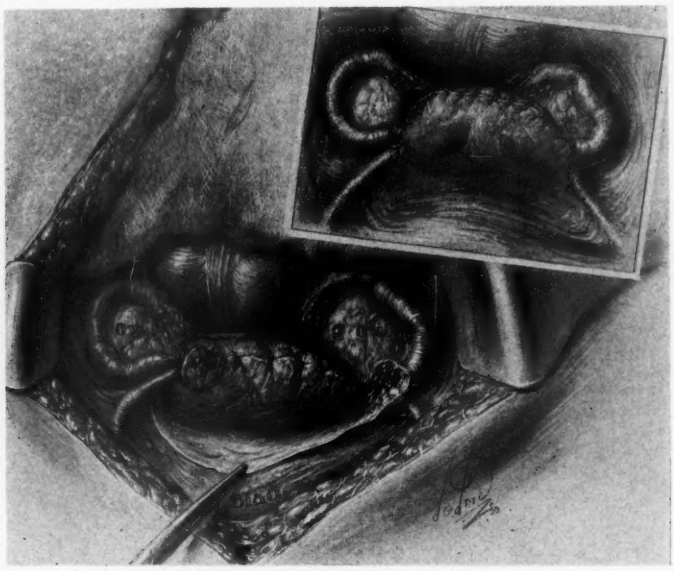

FIG. 5. Anchoring round ligaments to cervical stump; closure of cervical stump.

As our technic improved with this operation it was natural that our indications broadened and for some of these indications we may be criticized. However, our decisions rested upon the study of each individual case and we felt justified in what we did at the time.

The indications for the majority of the cases reported herein were as follows: (1) Fibroids with or without degeneration; (2) sepsis; (3) ablatio placentae with uncontrollable hemorrhage; (4) placenta praevia with uncontrollable hemorrhage; (5) partly ruptured uteri; and (6) completely ruptured uteri.

While the majority of obstetricians at the present date would prefer doing a cesarean followed by a possible hysterectomy for some of the indications mentioned above, we are confident that as their experience grows with this procedure and they see the lessened degree of shock as compared with other procedures, they will perform this operation more frequently. It is difficult to believe, but it is a clinical fact, that these patients are noticeably less shocked and recuperate faster with this procedure than do those who have had a simple, classical cesarean section.

Recently Waters has revived interest in extra peritoneal cesarean section for the frankly infected case. We heartily endorse this procedure for those occasional infected cases, particularly in primiparae, who have normal uteri; but many times we see frank infection particularly in multiparae exhibiting additional complications such as fibrotic uteri or severe hemorrhage, and any type of cesarean in those cases, in our experience, is contraindicated because they are bad risks postoperatively. We prefer to sacrifice the uterus and the future function of childbirth in that type of case rather than the mother.

The total number of cases in this series was 233; fourteen mothers died. The causes of death were as follows after postmortem examinations were made: (1) Uremia and abscess of the lung; (2) placenta praevia (two cases); (3) hydronephrosis with kidney destruction; (4) embolism (three cases; death was sudden after patient was convalescing satisfactorily); (5) cardiac decompensation (two cases); (6) detached

placenta with severe hemorrhage and shock (two cases); (7) fibroids complicated by bowel obstruction caused from an old hernia from a previous appendectomy; (6) paralytic ileus; and (9) peritonitis following evisceration of the bowel through a broken down incision on the fifth day.

The total number of dead babies was fifty-three. Of this number twenty-six were nonviable, eighteen were known to be dead and nine died within one week.

CONCLUSION

1. A description of a modified Porro operation is given.

2. The indication for this procedure many times is not the safe delivery of a live child but the saving of a mother's life.

3. It is our belief that this operation has a very definite place in operative obstetrics in infected, undelivered cases of pregnancy, because of the absence of spill from the uterus and the minimum blood loss.

4. This procedure also has a place in the management of uncontrollable bleeding cases.

5. Lack of shock is one of the important points of this operation.

REFERENCES

1. Myers, W. H. *Am. J. Obst.*, 26: 933–935, 1892.
2. Parish, W. H. *Am. J. Obst.*, 16: 1197–1207, 1883.
3. Parish and Allis. *Am. J. Obst.*, 20: 503–506, 1887.
4. Richardson, E. *Am. J. M. Sc.*, 81: 36–46, 1887.
5. Taylor, I. E. *Am. J. M. Sc.*, 80: 115–129, 1880.
6. Harris, R. P. *N. Y. J. Gynec. & Obst.*, 3: 484–486, 1893.
7. King, A. F. A. *Am. J. Obst.*, 17: 348–355, 1884.
8. Lewis, D. *Am. J. Obst.*, 30: 354–360, 1894.
9. Martin, C. *Brit. M. J.*, 2: 1369, 1894.
10. Mayo, W. J. *Am. J. Obst.*, 33: 54–58, 1896.
11. Gill, J. J. *Am. J. Obst. & Gynec.*, 21: 137–138, 1931.
12. DeCourcy, G. *Am. J. Surg.*, 10: 299, 1930.
13. Lewenthal, M. L. *Am. J. Obst. & Gynec.*, 25: 748–749, 1933.
14. Rosenfild, S. S. *Am. J. Obst. & Gynec.*, 21: 556–557, 1931.
15. Newsorn, E. T. *South. N. J.*, 16: 961–962, 1923.
16. Harrison, V. *Virginia M. Month.*, 47: 491, 1921.
17. Tigert, H. M. *J. Tennessee M. A.*, 15: 132–135, 1922.
18. Adam, G. A. *Australia M. A.*, 12: 300–304, 1890.
19. Alexander, W. *Lancet*, 1: 169, 1887.
20. Ashton, W. E. *Med. News*, 58: 369–371, 1891.
21. Baldwin, J. F. *Med. News*, 57: 138–141, 1890. Columbus, O. *Northwest M. J.*, 5: 18, 222, 1890.
22. Barnes, F. *Brit. M. J.*, 1: 122, 1885.
23. Barrow, D. *Am. J. Obst.*, 5: 36, 677–679, 1897.
24. Bartlett, J. *J. A. M. A.*, 7: 385–390, 1886.
25. Bishop, E. S. *Lancet*, 2: 1421, 1894.
26. Black, J. F. *Brit. M. J.*, 2: 128, 1892.
27. Black, J. J. *Med. News*, 55: 480–482, 1889.
28. Boyd, G. M. *Am. Gynec. & Obst.*, 9: 323–325, 1896.
29. Buckmaster, A. *N. Y. Med. J.*, 64: 47–49, 1896.
30. Boldt, H. J. *Tr. Am. Gynec. Soc., Phil.*, 1898; *Am. J. Obst.*, 1897.
31. Child, C. G. *Tr. N. Y. Obst. Soc., N. Y.*, 16: 153–155, 1913.
32. Grossman, P. *Am. J. M. Sc.*, 86: 477–479, 1883.
33. Harrison, V. *Virginia M. Month.*, 47: 491–495, 1920–1921.
34. Hart, D. B. *Edin. M. J.*, 2: 532–538, 1909.
35. Horrocks, W. H. *Brit. M. J.*, 1: 360, 1904.
36. Red, C. B. *Am. J. Obst.*, 42: 68–74, 1900.
37. Wagner, C. *Am. J. Obst.*, 49: 195–200, 1904; *Illinois M. J.*, 7: 1–9, 1905.
38. Waters, E. G. *Am. J. Obst.*, March, 1940.

UMBILICAL HERNIA*

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APPROXIMATELY eighty thousand hospital admissions were recorded at the University Hospital during the last eighteen years. During this period sixty-two umbilical hernias were encountered. Of these sixty-two, seven were present at birth as a herniation into the cord structures, twenty-two were noted soon after birth and thirty-three were of the adult type. Umbilical hernia in each of the three age groups will be considered.

The case records of the seven newborn with a congenital umbilical hernia excited further interest. An additional eighty-four cases, reported in the literature during the last forty years, were reviewed. The data presented in these ninety-one cases were studied.

Hernia into the umbilical cord, known also as exomphalos or congenital umbilical hernia, may be either of an embryonic or fetal origin. Congenital umbilical hernia of an embryonic origin is not a true hernia. Organ contents of the umbilical sac usually regress into the abdominal cavity near the end of the third month of intra-uterine life. Subsequently, the anlage of the umbilicus is formed. Rarely the umbilical sac contents partially or completely fail to regress into the abdominal cavity but remain and develop in the cord anlage. Consequently, at birth there is a congenital umbilical hernia of an embryonic origin. With an early arrest of development the defect may extend from the symphysis to the manubrium; and even if the newborn is viable, the extent of the malformation and frequent associated abnormalities, preclude the possibility of surgical cure. Three cases of this extensive maldevelopment were recorded. The fetal congenital umbilical hernia is a true herniation of the abdominal contents and develops after the third month of intra-uterine existence. It consists of an actual protrusion of organs after normal regression into the abdominal cavity. Most of the reported cases of congenital umbilical hernia were of embryonic origin while a few were probably of fetal origin.

TABLE I
INCIDENCE OF CONGENITAL UMBILICAL HERNIA

Author, Institution	Years	Hospital Admissions	Deliveries	Cong. Umb. Delivered in Hospital	Hernia Admitted with Pathology
University Hospital.....	1922–40	80,000	5,197	2	5
Hebert, A. F. ?.....	?	?	56,385	20	
Lindfors, Munich Mat...	1862–81	?	5,184	1	
Balantyne ?.....	?	?	5,000	1	
Watson ?.....	?	?	5,000	1	
Block Berlin Charite.....	?	?	5,000	1	
Vienne Paris Charite.....	?	?	3,043	0	

Table I indicates the incidence of this type of hernia at the University Hospital and other institutions.

The pathology was encountered in twice as many males as females and occurred equally among the newborn of primipara and multipara. In only three instances, abnormalities were recorded in the other children. Four histories listed complications during pregnancy. Lues was not considered a factor, however, Paucot reports the condition in three successive fetuses delivered of a luetic mother.

Table II indicates the incidence of the various types of concomitant abnormalities. More than one congenital defect was present in approximately one-third of the cases.

Large hernial sacs may rupture during the course of the delivery. Four cases were found in which this had occurred. Two

* Read before the meeting of the Oklahoma City Clinical Society, November 1, 1939.

patients were operated upon with one death; two were treated conservatively and both expired. The presence of a congenital

Table II

VARIOUS MALFORMATIONS RECORDED IN NINETY-ONE CASES OF CONGENITAL UMBILICAL HERNIA

	No. of Cases
Malformations	
Meckel's Diverticulum	6
Multiple and extensive	3
Anencephaly	2
Atresia of descending colon	2
Spina bifida	2
Nonrotation of large intestine	1
Epispadias	1
Absence of common bile duct	1
Macroglossia	1
Cleft palate	1
Hare lip	1
Patent omphaloenteric duct	1
Mongoloid	1
Imperforate anus	1
Stenosis of colon	1
Microcephaly	1
Hydramnion	1
Absence of the tibia, left	1
Absence of right radius and ulna	1

hernia was not noted at delivery in three infants, the cord was ligated incarcerating

Table III

STRUCTURES FOUND TO OCCUPY THE SAC

	No. of Cases
A. Multiple organs	
Small and large intestine	13
Liver and small intestine	9
Small and large intestine, cecum, appendix	7
Ileum, cecum and appendix	5
Small intestine, Meckel's diverticulum	4
Liver, small and large intestine	4
Small intestine, Meckel's diverticulum, cecum, appendix	4
Liver, small and large intestine, appendix	2
Stomach, liver, intestine and spleen	1
Cecum and appendix	1
Liver and gallbladder	1
Heart and abdominal contents	1
Liver, spleen, small and large intestine	1
Liver, stomach and small intestine	1
Liver, stomach, small and large intestine	1
Gallbladder, small and large intestine	1
Abdominal contents	3
Total	59
B. Single organs	
Small intestine	21
Liver	9
Meckel's diverticulum	2
Total	32

a loop of ileum in one and a Meckel's diverticulum in two. Obstruction supervened in the former with a fatal termination while the latter developed a fecal fistula which later was closed successfully.

The hernial wall is composed of two avascular layers separated by a variable quantity of Wharton's jelly. The external layer merges with approximately one-half inch collar of skin at the base of the tumor. The internal layer is continuous with the peritoneum.

Several organs may occupy the sac. (Table IIIA.) In about one-third of the cases the sac contained only one structure. (Table IIIB.)

The prognosis is influenced by several factors: the diameter of the defect, the size of the hernia and the elapsed delay before the intervention.

Table IV

DIAMETER OF THE NECK OF THE SAC IN RECORDED INSTANCES

	No. of Cases
Diameter	
Less than 5 cm	52
More than 5 cm	26

In most instances the diameter of the neck of the sac is less than 5 cm., however, a considerable number present a large defect. (Table IV.) It was interesting to note that in six recorded cases the defect extended from the symphysis to the pubis and four survived surgical repair. If the patient is seen early, a rather large defect must not influence the surgeon to forego operative procedure. The hernial defect must be closed early and preferably within the first six hours. (Table V.)

Table V

MORTALITY IN RELATION TO THE DELAY BEFORE SURGERY

Delay	Patients Operated Upon	Patients Expired	Percentage Mortality
To 12 hrs	56	12	21.4
12 to 24 hrs	9	4	44.4
After 24 hrs	13	8	61.6

After twelve hours of delay the mortality increases rather markedly. The increase in mortality incurred with the delay of sur-

gery resembles that found in cases of ruptured peptic ulcers. Resection of bowel or incomplete closure of the defect usually results in a mortality. Two patients expired following bowel resection, three following resection of a Meckel's diverticulum and two of three following incomplete closure in which the liver was sutured into the wound. Of the nine patients treated conservatively, only one survived. In patients subjected to delayed surgery or treated conservatively, peritonitis is the most common cause of the fatal issue. One may safely conclude that surgical repair should be attempted in practically any instance, particularly if the patient is seen early and there is the slightest possibility that the defect may be closed.

In two of seventy-eight operations the hernia was repaired by the extraperitoneal method. This procedure may be used when the hernia is quite small. The amnion and Wharton's jelly are removed from the underlying peritoneum, the sac manually inverted and the anatomical layers are closed in turn. In one of the reported cases it was stated that the operator reduced the contents of the sac by twisting the cord and by ligation at the base. Any of the possible contents of these hernia may be incarcerated by such procedure.

In seventy-six cases the intraperitoneal method was used. An elliptical incision is made in the skin surrounding the base of the tumor. After ligation of the cord vessels, the peritoneal cavity is entered inferiorly. By careful dissection the sac structures are removed with the cuff of skin at the base. The hernial contents are reduced and the wound is closed in layers. Occasionally the peritoneal portion of the sac is densely adherent to the liver. No attempt should be made to remove it because of the danger of a profuse hemorrhage. The adherent portion may be returned to the peritoneal cavity. No other surgery should be attempted if it can be avoided, such as the removal of the appendix or a Meckel's diverticulum. In cases in which the liver had occupied the sac and was irreducible, after enlarging the original incision, it has been sutured to the wound edges and partially exteriorized. One of three patients survived this procedure. In some instances effective reduction can be maintained and the wound brought into apposition only by the use of through-and-through sutures.

Twenty-two of the sixty-two umbilical hernias were of the infantile type. All histories indicated that they were noted during the first or second month of life. Fourteen were of the male and eight were of the female sex. Other evidences of maldevelopment were infrequently seen. One infant presented a cleft palate and another an enlarged thymus. In the presence of an umbilical hernia a careful check of the inguinal regions should be made, for six of the twenty-two patients had bilateral inguinal hernia.

In most instances the protrusion is through the superior quadrant of the umbilical aperture since at this point the umbilical vein enters the falciform ligament. The fascial defect is usually of 1 to 2 cm. in diameter; it was not larger in any of these cases. Usually the sac is empty except during crying or straining of the infant.

Umbilical hernia of an infantile origin is responsive to mechanical treatment in children under five years of age. Treatment should be instituted as soon as the hernia develops. If effectively maintained, a cure may be expected within a few months. At this early stage it is recommended that the truss support be used for at least six months. If treatment is not instituted until after the first year, the mechanical support should be applied continuously for a year or longer. Some few cases in this group, however, will not respond.

If the defect persists or increases in size after a thorough trial of the mechanical treatment, an operation is justified. Unless otherwise indicated surgery is not advisable before five years of age. The technic of the repair does not differ from that used in the adult, consisting of eradication of the sac, apposition of the recti muscles and trans-

verse overlapping of the fascia. If the blood supply seems adequate, the umbilicus may be preserved by placing the curved incision an inch or so inferior to the fascial defect.

Twenty of the thirty-three adults recalled the onset of an umbilical hernia between the ages of twenty and thirty; however, many presented themselves at a later date for operation. (Table VI.)

Table VI
AGE AT TIME OF SURGERY

Age	No.
21–31	7
31–41	9
41–51	9
51–61	5
61–71	3

The sex and race distribution is indicated in Table VII.

Table VII
SEX AND RACE INCIDENCE

Sex	No.	Race	No.
Males	8	White	29
Females	25	Negro	3
		Indian	1

Undue exercise, falls, direct injuries, suppuration at the umbilicus or rapid loss of weight may be occasional etiological factors. Obesity and multiple pregnancies seem to have a greater influence. (Table VIII.)

Table VIII
POSSIBLE ETIOLOGICAL FACTORS

Factors	Incidence
Multiple pregnancies	19 of 25 females
Obesity	25 of 33 cases

Thirty-three adult patients were submitted to surgery. In most instances the defect was of less than one inch in diameter and no defect was found larger than three inches. As with the infantile hernia the defect was at the point of the obliterated umbilical vein in the umbilical cicatrix. Diastasis recti was the rather common finding in the female. The hernial coverings consist of the peritoneal sac, transversalis fascia and skin. Structures encountered in the sac are listed in Table IX.

Strangulation is not an uncommon complication in the adult. Four of the thirty-three surgical cases presented strangulation of the sac contents. About one of every eight umbilical hernias will strangulate. In two instances intestinal resection was necessary. Simple release of adhesions sufficed in the other two cases.

Table IX
SAC STRUCTURES

Structures	No. of Cases
Adherent omentum	17
Adherent small bowel and omentum	7
Adherent colon and omentum	2
No structures in the sac	17

There were no deaths among the twenty-nine adult surgical cases. Of the four additional cases with strangulation, two patients expired. The operation of simple umbilical hernia is usually considered to present a mortality of from 1 to 3 per cent. With strangulation this mortality will vary between 30 and 50 per cent.

These cases have not been checked regarding the percentage of recurrence. Transverse overlap of fascia is followed by a recurrence rate of about 10 per cent while that of other methods may be as high as 20 per cent.

Preliminary preparation of the patient contributes to the success of surgery. Adequate weight reduction can not be overemphasized. The obese patient must be placed on a low caloric diet with thyroid administration if the basal rate is below normal. An anemia is corrected, the cardiac status carefully evaluated and the renal function thoroughly checked. In instances of voluminous hernias the use of the abdominal binder for a period of time is advisable.

Unless concomitant pelvic surgery is indicated the transverse overlap of the fascia is conceded to be the best type of repair. The hernial protrusion is enclosed by a transverse ellipitical incision; the underlying fascia is exposed by dissection of the fat to the neck of the sac at all points. The sac is entered at a suitable point at the neck. Any adherent omentum is freely ligated and divided but not dissected. An adherent bowel is either carefully dissected free or returned to the

abdomen with portions of the sac. After the peritoneum is closed, the recti muscles are brought into apposition, if possible. The authors prefer the use of continuous chromic catgut for the peritoneum and interrupted chromic catgut for the muscles. The fascial flaps are overlapped transversely by interrupted chromic mattress sutures. The subcutaneous tissue is closed to eliminate dead space and a small soft rubber drain at this point is advisable. Meticulous hemostasis insures no postoperative hemorrhage.

Should any indication of postoperative distention develop, the Levine nasal tube with continuous gastric suction must be employed. A low Fowler position and frequent turning of the patient allays pulmonary complications. Adequate intravenous glucose and subcutaneous saline are administered to insure an output of 1,200 to 1,500 cc. of urine per twenty-four hours. It is essential that the patient remain in bed at least three weeks and wear an elastic belt for a year or longer. Undue weight gain must be avoided.

SUMMARY

One case of congenital umbilical hernia may be encountered in every five thousand deliveries. One third of the cases of congenital umbilical hernia will have more than one congenital defect. Careful inspection of the cord will preclude the ligation of a loop of intestine in a small congenital hernia. The hernial defect must be closed early and preferably within the first six hours.

An inguinal hernia will be present in about 30 per cent of the infants with an infantile umbilical hernia. As a rule surgery should not be instituted for an infantile umbilical hernia before five years of age.

Strangulation occurs in one of every eight umbilical hernias of the adult type. A mortality of 1 to 3 per cent for surgical repair of the umbilical hernia is increased to 30 to 50 per cent in the presence of strangulation. Adequate weight reduction is important and voluminous hernias should be subjected to an abdominal binder for a period of time. The surgical repair is best accomplished by the Mayo transverse fascial overlap.

BIBLIOGRAPHY

Congenital Umbilical Hernia:

1. Allison, Kathleen A. Congenital umbilical hernia. *Brit. M. J.*, 2: 319, 1930.
2. Baker, S. W. An unusual case of exomphalos or extroversion of the viscera in a newborn. *Canad. M. A. J.*, 20: 512, 1929.
3. Bullard, J. W. Congenital hernia of the liver into the umbilical cord, with report of a case. *Am. Med.*, 4: 742, 1902.
4. Bonney, Victor. Hernia into the umbilical cord. *Proc. Roy. Soc. Med., Obst. & Gynec. Sec.*, page 228, 1913–1914.
5. Cutler, George David. Prolapse of the bowel through a patent omphalo-mesenteric duct opening on the side of the umbilical cord. Report of a case with operation. *Boston M. & Surg. J.*, 190: 782, 1924.
6. Caudill, E. L. Hernia of the liver and intestine in the newborn. *Virginia M. Monthly*, 49: 201, 1922.
7. Cullen, Thomas S. Sloughing amniotic hernia of the umbilicus. *Am. J. Obst.*, 78: 457, 1918.
8. Cannon, D. T. Exomphalos in an infant. *Irish J. Med. Sc.*, sixth series, p. 326, 1926.
9. Dott, Norman M. Clinical record of a case of exomphalos. *Tr. Edinburgh Obst. Soc.*, 52: 105, 1931.
10. Durlacher. The viability of newborn infants with very large umbilical hernias. *München. med. Wchnschr.*, 76: 114, 1929.
11. Dagneau, P. O., Trempe, F. and Langlois, M. Atypical diverticular umbilical hernia. *J. de med. de Paris*, 54: 1065, 1934.
12. Dyas, Frederick G. Umbilical hernia in a baby eight hours old at the Cook County Hospital. *Surg. Clin. Chicago*, 4: 449, 1920.
13. Downes, William A. Umbilical cord hernia. Transactions of the New York Surgical Society. *Ann. Surg.*, 51: 113, 1910.
14. Fowelin, H. and Bode, P. Incarcerated umbilical hernia, cured by radical operation nine hours postpartem. *München. med. Wchnschr.*, 71: 1198, 1924.
15. Finsterer, J. Treatment of hernia of the umbilical cord. *Wien. klin. Wchnschr.*, 19: 795, 1906.
16. Gordon, J. W. Omphacele congenitalis. *J. Michigan M. Soc.*, p. 533, 1932.
17. Genschel, J. Zur Kasuistik des Nabelschnurbruches. *Zentralbl. f. Gynäk.*, 45: 1750, 1921.
18. Glass, O. Massive umbilical hernia with enterocystoma in a newborn. *Am. J. Obst. & Gynec.*, 29: 748, 1935.
19. Harries, J. F. A case of hernia into the umbilical cord. *The Lancet*, 773, 1886.
20. Hipsley, P. L. *M. J. Australia*, 2: 484, 1925.
21. Horwitz, A. Hernia of the umbilical cord. *Ann. Surg.*, 92: 454, 1930.
22. Hipsley, P. L. Large congenital umbilical hernia. *M. J. Australia*, 1: 525, 1929.

23. JAURISTI, V. and ARRAIZA, D. Umbilical hernia and spina bifida. *Arch. españ. de pediat.*, 13: 193, 1929.
24. KRUMM, J. F. Congenital hernia of umbilical cord with eventration and absence of sac. *Am. J. Obst. & Gynec.*, 22: 442, 1931.
25. KNAUF, F. P. Umbilical cord hernia. *Wisconsin M. J.*, 28: 313, 1929.
26. KENNEDY, A. E. Hernia into umbilical cord. *Brit. M. J.*, 1735, 1901.
27. KUSS, G. Umbilical hernia of embryonic type. *Bull. et mém. Soc. nat. de chir.*, 56: 234, 1930.
28. LUDWIG, F. Die Operative Behandlung von Nabelschnurbruchen. *Ztschr. f. Geburtsh. u. Gynäk.*, 105: 308, 1933.
29. LOTHEISSEN, G. Hernia of the umbilical cord. *Wien. klin. Rundschau*, 17: 757, 1903.
30. MCCAUGHAN, J. J. Massive congenital hernia into the umbilical cord. *Memphis M. J.*, 10: 17, 1935.
31. MORAN, M. M. Umbilical cord hernia. *Am. J. Surg.*, 1905, 142.
32. MOST, A. Patent omphaloenteric duct and umbilical hernia. *Beitr. z. klin. Chir.*, 144: 236, 1928.
33. MOTTA, DE OLIVEIRA. Umbilical hernia. *Rev. de gynec. e d'obst.*, 23: 403, 1929.
34. MEREDITH, E. W. Congenital hernia of the umbilical cord. *New York M. J.*, 83: 138, 1906.
35. MILCH, H. Adherent congenital umbilical hernia. *Am. J. Dis. Child.*, 42: 608, 1931.
36. MCILROY, P. T. and HAINES, C. E. Newborn baby with massive umbilical hernia. *Am. J. Surg.*, 21: 297, 1933.
37. MANCH, M. B., and FRESHMAN, E. Congenital umbilical hernia. *The Lancet*, 701, 1933.
38. MILLER, H. E. Hernia funiculi umbilicalis by A. F. Hebert. *Am. J. Obst. & Gynec.*, 15: 86, 1928.
39. MATHIS, E. G. Congenital umbilical hernia. *Texas State J. Med.*, 12: 261, 1916.
40. NIEBUHR, W. A., DRESCH, C. A. and LOGAN, F. W. Hernia into the umbilical cord containing the entire liver and gallbladder. *J. A. M. A.*, 103: 1386, 1934.
41. OGILVIE, W. H. Case of exomphalos closed by operation, and a specimen of a similar case in which closure was impossible. *Roy. Soc. Med., London, Obst. & Gynec. Sec.*, 7: 228, 1913–1914.
42. OBERHOLZER, J. Treatment of socalled umbilical hernia in newborn infants. *Zentralbl. f. Gynäk.*, 59: 2062, 1935.
43. PALMER, F. A. Congenital umbilical hernia. *Surg., Gynec. & Obst.*, 12: 526, 1911.
44. POLONSKY, R. J. Aur Frage von den Angeborenen Bauchbruchen. *Anat. Anz.*, 74: 56, 1932.
45. PECIRA, L. L. Strangulated umbilical hernia. *Surg., Gynec. & Obst.*, 43: 74, 1926.
46. PAUCOT, H. and GELLE P. Embryonal umbilical hernia repeated in three successive fetuses, probable role of heriditary syphilis. *Bull. Soc. d'obst. et de gynéc.*, 25: 296, 1936.
47. POWER, D'ARCY. *Tr. Path. Soc. London*, 39: 108, 1887.
48. REED, E. N. Congenital umbilical hernia. *J. A. M. A.*, 61: 199, 1913.
49. REESE, G. H. Hernia of the liver into the umbilical cord. *J. A. M. A.*, 74: 803, 1920.
50. STANTON, W. J. Case of incarcerated hernia into the umbilical cord. *J. A. M. A.*, 74: 803, 1920.
51. SAUNDERS, H. P. Surgical treatment of congenital umbilical hernia. *Illinois M. J.*, 56, 1927.
52. SMITH, F. R. Incarcerated hernia into the umbilical cord of newborn. *Bull. Lying-in Hosp., City of New York*, 13: 401.
53. SOBERON, M. R. A new case of umbilical hernia. *Gac. méd. de Mexico*, 63: 250, 1932.
54. SIEVERS, RODERICH. Reduction of congenital umbilical hernia by twisting of the umbilical cord. *Zentralbl. f. Chir.*, 56: 3014, 1929.
55. THUNIG, L. A. Hernia into the umbilical cord and related anomalies. *Arch. Surg.*, 33: 1021, 1936.
56. VINCENZO, J. Fetal diverticular hernia operated upon 12 hours after birth. *Policlinico*, 36: 1833, 1929.
57. VOGELER, K. The operation for liver prolapse in the presence of umbilical hernia. *Zentralbl. f. Chir.*, 53: 642, 1926.
58. WULSTEN, J. The operative treatment of congenital umbilical hernia. *Zentralbl. f. Chir.*, 62: 1885, 1935.
59. WOLLSTEIN, M. Umbilical cord hernia. *Arch. Pediat.*, 21: 416, 1904.
60. WEEKS, A. Large congenital sliding hernia of the cord. *Surg. Clin. North America*, 6: 377, 1926.
61. WILLIAMS, C. Congenital defects of the anterior abdominal wall. *Surg. Clin. North America*, 10: 805, 1930.
62. ZANETTI, S. On a case of congenital umbilical hernia. *Pediatria. prat.*, 6: 373, 1929.

Infantile and Adult Types:

1. BERGGLAS, B. Genesis and therapy of umbilical hernia. *Arch. f. Gynäk.*, 152: 214, 1933.
2. BANCROFT, F. W. Hernia. *Pennsylvania M. J.*, 40: 63, 1936.
3. CARTER, R. F. Umbilical hernia, types and treatment. *Arch. Pediat.*, 49: 622, 1932.
4. MILLER, R. H. and BARTLETT, M. K. Umbilical hernia. *New England J. M.*, 209: 565.
5. WATSON, LEIGH F. Hernia. C. V. Mosby Company.

A FOLLOW-UP OF HERNIA REPAIR IN MENTALLY SICK AND MENTALLY DEFICIENT PATIENTS*

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REPORTS of the results of the operative treatment of hernia from general hospitals and surgical clinics are frequently seen in the surgical journals; however, the hernia problem in mentally sick and mentally deficient patients, although known to many surgeons, has not been summarized in the literature very extensively, nor have the problems encountered in this group of patients been given due attention. Some writers[1,2] have stressed the psychiatric complications in surgical problems and the value of the psychiatrist in relation to surgery but very little attention has been given to the problem from the standpoint of the actual handling of psychiatric cases by the surgeon. It is our purpose in this paper to summarize our experience at the Metropolitan State Hospital with fifty patients suffering from hernia who were treated by surgical measures.

STATISTICS

The series included thirty-one committed psychotic patients and nineteen mentally defective patients from the Walter E. Fernald State School. Psychiatric diagnoses are classified in Table I. There were forty-six males, twenty-nine from the Metropolitan State Hospital and seventeen from the Walter E. Fernald State School, and four females, two from the Metropolitan State Hospital and two from the Walter E. Fernald State School.

Age of Patients. These varied in age from the age of sixteen to sixty-five plus. (Table II.) One notes that the Walter E. Fernald State School patients were all below the age of forty-five at the time of operation and that the majority of the Metropolitan State Hospital patients were above that age group. As the greatest percentage of recurrences occurred in the Metropolitan State Hospital patients this one factor lends itself to some comparative analysis. In a rather large series of adult normal patients reported by Longacre[4] in the indirect group 65 per cent of the patients were under thirty-five years of age and only 26 per cent were over forty-five, while 51 per cent of the patients with direct inguinal hernias were under thirty-five years, while 46 per cent were over thirty-five. In our group, 22 per cent of indirect inguinal hernias were under thirty-five, while 78 per cent were over thirty-five. In the direct inguinal hernias, 34 per cent were under thirty-five and 66 per cent over thirty-five.

Type of Hernia. For hernias classified as to type see Table III. Twelve patients (Metropolitan State Hospital, eight; Walter E. Fernald State School, four) had bilateral inguinal hernias. As can be noted from the table sixty-eight, or 93 per cent, of hernias were of the inguinal type, of which thirty-two, or 47 per cent, were direct inguinal hernias. The large proportion of the direct inguinal hernias occurring

* From Metropolitan State Hospital, Waltham, Massachusetts.

in the younger age group of the Walter E. Fernald State School patients is to be noted. According to Watson[5] direct inguinal hernia is infrequent, constituting only about 5 to 7 per cent of all inguinal hernias. It is stated that more recent views

Table I

Diagnosis	Number of Cases
Schizophrenia	15
Alcoholic psychosis	4
Psychosis with mental deficiency	4
Manic-depressive psychosis	3
General paralysis	1
Traumatic psychosis	1
Psychosis with cerebral arteriosclerosis	1
Paranoid condition	1
Involutional psychosis	1
Mental deficiency (W.E.F.S.S.)	
Imbeciles	11
Morons	7
Borderline	1

indicate that the percentage of direct inguinal hernias may be as high as 25 to 30 per cent.[6] A consideration of the condition of the muscles and fascia in a large proportion of these cases will be made below. Of this group five patients, or .7 per cent, were incarcerated. The recurrent inguinal hernias were difficult to diagnose at times but the majority were of the direct type. Figure 1 illustrates the usual size and type of hernia encountered.

Table II

Age Groups	Number of Cases	
	M.S.H.	WEFSS
65+	2	0
60–65	3	0
55–60	9	0
50–55	5	0
45–50	3	0
40–45	2	4
35–40	4	3
30–35	2	1
25–30	1	4
20–25	0	3
15–20	0	4

Type of Operation. These patients were all treated by surgical measures, which will be described below. There were no deaths as a result of the operation. One operation could not be completed because of the

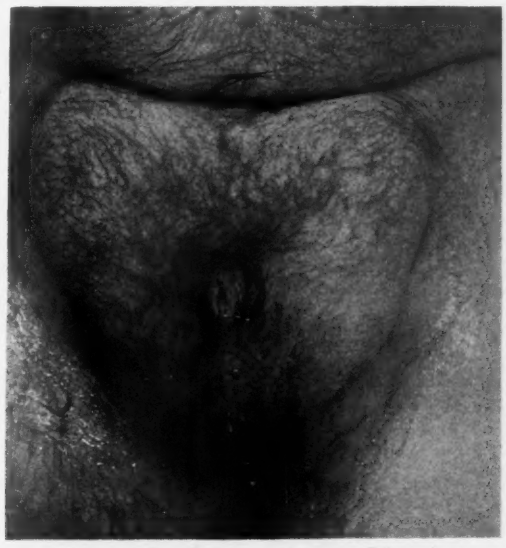

Fig. 1. Usual size and type of hernia.

patient's poor condition incident to poor response to anesthesia. One patient died several months later of pulmonary tuberculosis but did not have a recurrence of his hernia at time of death. Another patient died and, although there was no recurrence shortly after the operation, a satisfactory follow-up was impossible.

Table III

	M.S.H.	WEFSS
Indirect inguinal		
Right	9	2
Left	6	1
Direct inguinal		
Right	9	10
Left	8	5
Recurrent inguinal	11	7
Postoperative	2	1
Umbilical	1	0
Omental	0	1

Due to the fact that most of the hernias were inguinal (all except five) the end results will be considered only in this group. There was a total of sixty-eight operations, two of which were not completed. Three different types of surgical procedure were used as follows: (1) The regular (Bassini

modified)* operation was performed on twenty-two Metropolitan State Hospital patients and on ten Walter E. Fernald State School patients. (2) The regular operation plus the use of commercial fascia lata strips was performed on twelve Metropolitan State Hospital patients and on five Walter E. Fernald State School patients. (3) The regular operation plus patient's own fascia lata strips was performed on seven Metropolitan State Hospital patients and on ten Walter E. Fernald State School patients.

The Bassini operation[3] was performed except that after excision of the sac the stump was transfixed to the transversalis muscle. In the cases in which fascia lata was used the Bassini operation was performed, and the fascia lata was used as sutures by weaving back and forth to form a sort of lattice work to approximate the muscles to Poupart's ligament.

Results of Operation. In the regular operative group there was no recurrence in fifteen patients or 46 per cent. These cases were re-examined after operation as follows: four years, seven; three years, three; two years, three; one year, two.

In the commercial fascia lata group, there was no recurrence in fourteen patients, or 72 per cent. These cases were re-examined after operation as follows: two years, six; eighteen months, five; one year, three.

In the group in which the patients' own fascia lata were used in the repair, there was no recurrence in twelve, or 64 per cent. These cases were re-examined after operation as follows: four years, four; three and one-half years, five; three years, one; two and one-half years, two. In this group of cases the best results were obtained in the commercial fascia lata group. One has to evaluate these figures with care in view of the fact that the cases were not followed for as long a period of time as those in the other groups.

In summary there was no recurrence in the entire group of patients in forty-two instances, or 61.7 per cent. The greatest percentage of recurrences occurred in the Metropolitan State Hospital cases, as can be surmised from the following figures. Metropolitan State Hospital—no recurrence, nineteen (67.86 per cent), Walter E. Fernald State School, fifteen (88.24 per cent), average of total, 75.6 per cent. Recurrence—Metropolitan State Hospital nine (32.14 per cent), Walter E. Fernald State School two (11.76 per cent), average of total, 24.4 per cent.

Recurrence of hernias occurred in the indirect inguinal group in five instances, in the direct inguinal group in four instances and in the recurrent inguinal group in twelve instances. We were unable to complete the operation in one case (two hernias); one patient died. Of the indirect inguinal group, one case recurred in a few days, one in a period six to twelve months, two in a period between twelve to eighteen months, and one in a time interval between eighteen to twenty-four months. In four instances the regular type of operation was used and in one instance the commercial fascia lata operation was used.

Of the direct inguinal group, one case recurred in fifty-six months, one in twenty-eight months, one in two months and in one case the exact time of recurrence was unknown. The types of operation used were: regular operation, 1; commercial fascia lata, 1; patient's own fascia lata, 2.

Of the recurrent inguinal hernia group seven cases recurred in less than three months, three in six to twelve months, one in sixty months and in one case time of recurrence was unknown. Types of operation used: regular operation, seven; com-

* (a) Incision 2 cm. above and parallel with the inner half of Poupart's ligament, the skin being divided for a distance of about 10 cm.; (b) splitting of the fibers of the external oblique, from the external ring to a point slightly above the inguinal ring; (c) liberation and opening of the sac, with reduction of the contents; (d) removal of the sac flush with the peritoneum, after transfixation and ligation of the neck; (e) suture of the internal oblique and transversalis muscle to the shelving portion of the inguinal (Poupart's) ligament, underneath the spermatic cord which is elevated and retracted; (f) suture of the divided aponeuroses of the external oblique over the cord; (g) suture of the subcutaneous fascia and skin.

mercial fascia lata, one; patient's own fascia lata, four. The problems associated with recurrence in the same patients are described more fully below.

We should mention that the recurrences occurred in the majority of instances in patients who were operated upon at other hospitals the first time. Brief notes of their cases are made to summarize the nature of these cases.

CASE REPORTS

Case I. Psychosis with mental deficiency, imbecile, age 54, had been suffering from a hernia for "many years" which was repaired for the first time in 1933 at another hospital. A second attempt at repair was made at this hospital in September, 1934, at which time it was noted that the previous repair had been of the Halstead type, with cord transplanted beneath the skin. A direct herniation was found through the fascia transversalis. The hernia was repaired on the right with patient's own fascia lata. On October 29, 1934, the left hernia was repaired, the usual operation with transplantation of the cord was used. The left hernia recurred shortly after the operation and was again repaired on January 4, 1935, at which time it was noted that anatomic landmarks were markedly obscured and the patient's own fascia lata was used. This recurred shortly after operation and on March 1, 1935, a left orchidectomy was done and the usual type of operation utilized, since which there has been no recurrence. Patient also has multiple sclerosis, a hypertrophied prostate and had previously been operated upon for papillary adenocystoma of the thyroid gland.

Case II. General paralysis, age 58, had been operated for the first time in 1935, and on March 28, 1936, a bilateral recurrent indirect inguinal hernia was noted. A fascia lata transplantation operation was done. The course was complicated by elevated temperature and four weeks later the hernia recurred. On July 31, 1936, a bilateral repair, regular operation, was again attempted, and there was recurrence on the left shortly after the operation.

Case III. Patient, age 32, suffering from a traumatic psychosis, was operated upon February 16, 1935. The wounds became abscessed; the patient kept them opened with his fingers in spite of supervision. He later stated that he did this because he did not wish to live and thought that if he infected his wounds this would hasten his death. The hernia recurred and he was re-operated upon September 9, 1937; a fascia lata repair, commercial type, was done and the hernia did not recur.

Case IV. The patient age 29, imbecile, had a right inguinal hernia present since birth, and was operated for the first time in 1930, with a recurrence in 1933 at upper end of the scar. Operation was performed here for the first time on June 6, 1936, his own fascia lata being used in the repair, with recurrence in March, 1937. Re-operation took place on May 18, 1937, with a commercial fascia lata, without recurrence to date.

In evaluating the results, various factors warrant serious consideration, the same factors that have to be kept in mind at the time that the original repair is considered. (Table IV.) At least 26 per cent were of more than one year standing and 16 per cent of more than five years standing as far as the clinical manifestations of hernia could be noted from the records. General gas-oxygen ether anesthesia was used in all cases except four, in whom spinal anesthesia was used. On this small number there is no object in trying to relate recurrence to the type of anesthesia used. It was the opinion of Longacre[4] in his group of cases that "the difference in the percentage of recurrence as related to the type of anesthesia used in the operation is very small."

Table IV

Duration of Hernias	Number of Cases
30 years	1
26 years	1
23 years	2
20 years	1
5–10 years	7
2– 5 years	4
1–2.5 years	3
6 months–1 year	8
3 months–6 months (1 postoperative)	8
Less than 3 months (1 herniation of omentum)	26
Unknown (1 umbilical, 1 postoperative)	12

Various postoperative complications were noted: infected wounds in nine in-

stances; unexplained elevation of temperature in fourteen instances; bronchopneumonia in four instances; unexplained cough in two instances; postoperative atelectasis in one; swelling of the testes in two instances; distention in one instance. Of the patients who suffered recurrences after repair only four had an uneventful convalescent period. Various associated findings were noted, the most important being the muscle and fascia deficiency; tissue turgor and poor muscle tone were encountered in the majority of the abdominal walls. This was present in practically all the cases and to a very preponderant degree in seven cases. These must undoubtedly play a large role in the recurrence of hernias after operation. The associated conditions of note were elevation of blood pressure, hemorrhoids, varicocele, hypertrophied prostate, tumor of thyroid, varicosities, cardiac complications, von Recklinghausen disease, congenital syphilis and tuberculosis. Incarcerated hernias were found in five instances, scrotal hernias in seven.

Chromic catgut sutures were used in all the operations with silk used in the skin. Although no special catgut sensitivity tests were made, no such phenomenon was observed.

DISCUSSION

The above brief case histories illustrate in part at least some of the difficult aspects of the hernia problem in mentally sick and mentally deficient conditions. There are always many factors to be considered which are present in the same cases, viz., the patient is often not only a medical, neurologic and psychiatric problem but has distress occasioned by a hernia. Many patients do not complain of the symptoms found in normals, i.e., bulging in the region without pain, but wait till the hernia has become quite large or has started to produce definite distress, many times more objective than subjective. The cooperation so necessary in these cases is often lacking in the mentally ill; they will pick at their wounds; they will refuse to stay in bed, etc. These problems can be minimized only by the constant vigilance of the nurses and attendants who often must distribute their labors over many tasks. Limitation in numbers of personnel is a familiar observation.

There is one feature of interest—the relatively greater incidence of direct inguinal hernias in mental cases as compared to normals. There is too little known of the distinctive forces leading to the occurrence of direct and indirect hernias to offer a satisfactory explanation of this paradoxical situation. We have mentioned the common findings at operation of deficiencies in muscle and fascia, both in structure and extent. It appears reasonable to assume that these deviations are perhaps part of a greater defect evidenced by the mental states leading to hospitalization, on the one hand to mental hospitals and on the other to hospitals for the mentally defective. In the latter instance this explanation appears more plausible since organic defect is more readily visible and the variety of somatic abnormalities is more extensive as well as more common. Dietetic factors as well as physical exercise must also be considered from a theoretical point of view as causative agents in producing muscle and fascia defects. However, the average patient in state hospitals eats a well balanced diet and takes part in sufficient physical stress as to diminish their importance as such causative factors.

The relation of the duration of the hernia and recurrence appear worthy of some comment. It is obvious that there is a direct ratio of age of hernia to size of hernia and consequent strains upon fascia and muscle. Nevertheless, it is our experience that this becomes important only insofar as the condition of the fascia and muscles varies from good or poor. Indeed it is not implausible that the common finding of poor tissues accounts for the size of the hernia even in early cases. The choice of operation is determined by the condition of the tissues at time of operation. We are of the opinion that reinforcing measures, such as

fascia lata, become imperative when poor fascia and muscle are encountered. In extreme cases, orchidectomy is advisable to obviate the recurrence which experience teaches is almost inevitable in such cases.

The relative advantages and disadvantages of commercial fascia lata and autogenous fascia lata can not be satisfactorily determined from the small number of cases. In our series commercial fascia enjoys a slight advantage from the point of view of percentage of recurrence. Additional advantage accrues from the lack of additional operative work required, with consequent increase in total time of operation, as well as added nursing care and discomfort to the patient. The latter, from our point of view, becomes an important factor. We have, however, had none of the complications feared by removing the patient's own fascia lata, such as rupture and herniation of muscles nor infections of the thigh operations. In the case of commercial fascia lata where postoperative infection of the herniorrhaphy occurred, it could not be satisfactorily determined whether this was the result of the fascia lata or the patient interfering with the normal process of postoperative sterility and repair. On the whole, we are inclined to continue the use of commercial fascia lata because of its advantages as already discussed. We are furthermore disposed to believe that it is the method of choice in the majority of herniorrhaphies performed on mentally ill and mentally deficient patients suffering from hernias even where extensive tissue defect is not present. The extended use of fascia lata repair in non-psychotic and non-defective groups suffering from hernias is worthy of serious consideration.

SUMMARY

1. A follow-up of hernia repair in fifty mentally sick and mentally deficient patients is presented.

2. Nineteen patients were more than 50 years of age, twenty-four patients were between the ages of 25 and 50.

3. There was a total of seventy-three hernias, 93 per cent, or sixty-eight of which were inguinal; 47 per cent, or thirty-two were direct inguinal hernias.

4. Six patients had been previously operated upon elsewhere with many years interval since the original operation. The largest percentage of recurrences occurred in this recurrent inguinal group of cases.

5. Sixty-one per cent of the hernias did not occur with a follow-up of one to four plus years duration. Seventy-five per cent of the patients treated did not have a recurrence.

6. Some of the difficulties in the management of patients of this type are pointed out.

7. The type of operation among this group of patients is considered.

BIBLIOGRAPHY

1. EBAUGH, FRANKLIN G. The psychiatrist in relation to surgery. *Surg., Gynec. & Obst.*, 68: 372–376, 1939.
2. EBAUGH, FRANKLIN G. Psychiatric complications in surgery. *Bull. A. C. S.*, 22: 153–158, 1937.
3. BABCOCK, W. WAYNE. A Text Book of Surgery. Philadelphia, 1930. W. B. Saunders.
4. LONGACRE, ALFRED B. Follow-up of hernia repair. *Surg., Gynec. & Obst.*, 68: 239–246, 1939.
5. WATSON, L. F. Hernia. P. 181. St. Louis, 1924. Mosby.
6. Nelson Loose Leaf. Surgery.

LYMPHOSARCOMA

REPORT OF THREE APPARENTLY CURED CASES

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THE pathologic diagnosis, "lymphosarcoma," usually implies a fatal outcome. The life expectancy after diagnosis averages two years; 85 to 95 per cent of patients die before the expiration of five years and survival for a period of ten years is extremely rare.[1,2] In our files we have found three cases with survival period of six, eight and eleven years, respectively. At the present time there is no evidence of the disease in any of the three patients. The diagnosis was made histologically and found support in clinical observation and gross study. We do not believe that these lesions are benign lymphomas, a condition so rare and so nondescriptive that its existence finds repeated denials. Because unmistakable evidence to support the diagnosis was present, we prefer to consider that two of the patients were cured by early operation and one enjoys the rare distinction of spontaneous regression. We are fully cognizant of the difficulties in diagnosing primary malignant tumors of lymphnodes and we make no claims to infallibility, but each slide has been reviewed by at least four competent pathologists and their conclusions have been identical. We, therefore, record these cases for any light that may be thrown upon such an unfavorable disease and for any hope that they may offer to the patient and physician.

REPORT OF CASES

CASE 1. A white male, aged 37 years, was admitted to the University Hospital February 2, 1934. For eight months he had noted progressive general lassitude, anorexia and vague indigestion. Nausea and vomiting, without relation to meals had developed during the previous few weeks. There had been moderate loss of weight for three months. The few days prior to admission he thought that he had fever which was accompanied by "fever blisters."

He appeared somewhat wasted and pale. A scaly dermatitis was observed on the dorsum of the hands. The superficial lymphnodes were palpable. The abdomen was on a plane with the thorax and was tender to deep pressure in the epigastrium. Erythrocytes numbered 4,100,000 per cu. mm. and hemoglobin was estimated at 85 per cent. The leukocytes totaled 7,000 per cu. mm.; 69 per cent were polymorphonuclear neutrophiles, 24 per cent lymphocytes and 7 per cent were monocytes. Fluoroscopic examination with an opaque meal revealed an irritable pylorus and a suggestive filling defect. Occult blood was present in the feces. The gastric fluid contained an excess of free hydrochloric acid. Wassermann and Kahn reactions on the blood were negative. The clinical impression was chronic peptic ulcer of the pylorus with partial obstruction.

For one month a modified sippy regime failed to relieve the symptoms. Nausea and vomiting persisted and loss of weight was progressive. Surgical interference was deemed advisable. At operation a diffuse induration of the pylorus was noted. The serosa of the stomach was studded with small, firm nodules which were more numerous near the cardia. A posterior gastroenterostomy was performed and two small serosal nodules were removed for histologic study. The postoperative diagnosis was carcinoma of the stomach with lymphogenous spread to the serosa. The patient made an uneventful recovery and despite refusal of postoperative radiation therapy he gradually regained his health and is now living and well, six years after operation.

The histologic diagnosis was lymphosarcoma. The two small sections of tissue, without evidence of capsules, were 0.5 and 0.7 cm. in diameter. Microscopically they were composed of adipose tissue which was diffusely infiltrated

by a newgrowth of small spherical cells which resemble lymphoblasts. The cytoplasm was scant and generally indistinct and the nuclei were hyperchromatic. Many mitotic figures were seen. The cells were supported by a delicate reticulum and there was no orderly arrangement. Gradual replacement of the fat cells could be observed. (Figs. 1 and 2.)

Case II. A white male, aged 26 years, was admitted to the hospital May 14, 1932. He had noted a swelling at the angle of the left jaw for three weeks. As the mass gradually increased in size it became tender to pressure and later painful. Five years previously he had a similar mass on the opposite side which had been removed surgically and no pathologic examination was made. Two years previously a swelling at the site of the present tumor had completely regressed after incision.

He was well nourished and developed. A firm, freely movable mass 4 cm. in diameter was noted at the angle of the left jaw. It was slightly tender. There was no evidence of disease of the nose, mouth, throat or ears. The inguinal lymphnodes were palpable. Hemoglobin was 83 per cent and the leucocytic count 5,900 per cu. mm. Polymorphonuclear neutrophiles were 57 per cent, lymphocytes 40 per cent, monocytes 2 per cent and eosinophilic leucocytes 1 per cent. The Wassermann reaction of the blood was negative. The node was removed and a pathologic diagnosis of lymphosarcoma was made. Over a period of three weeks he received 1,600 roentgen units of therapy at the site. The patient is living and well eight years after removal and there has never been any recurrence or spread.

The gross specimen was a cellular encapsulated mass 4 by 3 by 3 cm. and on section was grayish, granular and slightly lobulated. Microscopically, the capsule of connective tissue was broad but was invaded by tumor cells. The architecture of the lymphnode was destroyed by a new growth of moderately sized cells with round, vesicular and hyperchromatic nuclei and scant cytoplasm. There was slight variation in the size of the cells. These tumor cells grew in irregular strands and groups throughout the lymphnode and were replacing the easily recognizable pre-existing lymphocytes. Many mitotic figures were seen. Karryorrhexis was prominent. (Fig. 3.)

Case III. A white female, aged 47 years, was admitted to the hospital May 12, 1929. She was a nervous individual with multiple complaints, chief of which were general lassitude of three or four months' duration and frequent attacks of diarrhea. Two months previously she had noticed a painless mass in the left inguinal region. The mass had slightly increased in size during this period.

An enlarged inguinal lymphnode, the size of a lemon, was the only significant physical finding. This was firm, fixed but not tender. The erythrocytes numbered 4,200,000 per cu. mm. and the hemoglobin was 80 per cent. Leukocyte count was 6,100 with 67 per cent polymorphonuclear neutrophiles, 23 per cent lymphocytes, 6 per cent monocytes and 4 per cent eosinophilic leukocytes. The Wassermann reaction on the blood was negative. The enlarged inguinal lymphnode was fixed to the surrounding tissue and was removed by blunt dissection. This was followed by roentgen ray therapy of 1,200 R. units over a period of five months.

The lymphnode, 4 by 4 by 2 cm., was limited by an apparent fibrous and fatty capsule. The cut surface was uniformly grayish and granular. Small yellow foci of fat, incorporated in the grayish tissue peripherally, indicated capsular invasion. A curved fibrous strand, continuous above and below with the capsule, separated the lymphnode into two unequal parts. The specimen seemed to represent a single node whose capsule had been penetrated. The node, however, was delimited by a pseudocapsule. Microscopically almost all of the architecture was obliterated, because only an occasional follicle could be seen. The sinuses were not apparent. The cells resembled lymphoblasts, the nucleus was round, vesicular, hyperchromatic and the cytoplasm was scanty. Some larger cells were present and there was an occasional true tumor giant cell. The capsule was invaded by these cells and they grew irregularly into the fat. The fibrous strand seen grossly is a broad sheet of loose collagenous connective tissue and on one side the cells are seen to have destroyed the pre-existing lymphnode and have extended through this strand into the adipose tissue. The patient is living eleven years after operation and there is no evidence of recurrence or extension. (Fig. 4.)

DISCUSSION

The survival period is not necessarily a criterion for cure of a malignant disease, but absence of recurrences and metastases

must also be considered. Radiation therapy may sometimes prolong the survival rate well past a ten-year period and still the disease may be present. A patient with Hodgkin's disease has been known to survive twenty-six years[3] and lymphatic leukemia has been held in check for twenty-five years.[4] While only one of our patients has survived the ten-year period, absence of recurrences and metastases in the other two, after periods of six and eight years, indicates a probable cure.

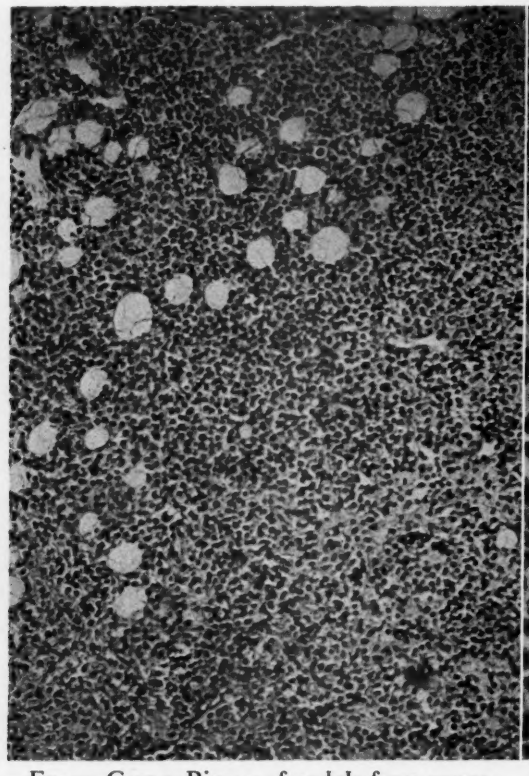

Fig. 1. Case 1. Biopsy of nodule from serosa of stomach. Note the wild growth of the tumor cells invading the fat. Hematoxylin and eosin stain. × 155.

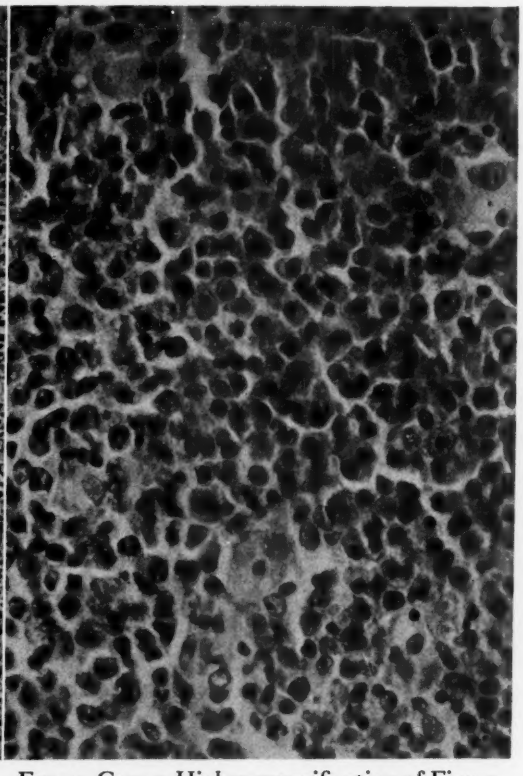

Fig. 2. Case 1. Higher magnification of Figure 1. The tumor cells resemble lymphoblasts with hyperchromatic nuclei. Mitotic figures can be seen. Hematoxylin and eosin stain. × 540.

Nathanson and Welch[1] followed 310 cases of malignant lymphoma, which included lymphosarcoma, lymphocytoma and giant follicular cell sarcoma. Only 6 per cent survived five years and 1.6 per cent were living after ten years. Of the fifty-five lymphosarcomas in their series, all died before the expiration of ten years and 82 per cent died before the fifth year. In Jackson's series,[2] the survival rate is similar; 17 per cent survived a period of three years and none were living at the end of the ten-year period. Recent reports in the literature give a better prognosis than the older ones. Craver[5] reported a survival rate of five years for twenty-one patients (15.9 per cent) of 132 patients treated with roentgen ray for lymphosarcoma. Five of these died after five years while two are living with evidence of the disease so that fourteen or 10.6 per cent are now living without evidence of the disease five years or longer. Hertzler[6] has aptly stated that a patient with lymphosarcoma rarely lives more than one or two years even in this day of roentgen ray therapeutics. If one does, the accuracy of the diagnosis is challenged and the case should be restudied.

We have repeatedly reviewed our specimens and find that both grossly and microscopically the criteria for the diagnosis of lymphosarcoma are present. In Case 1 it was presumed that the primary growth was from the submucosal lymphnodules of the stomach and only the secondary growths

were studied. These were distributed along the lymphatics and presented a mass of lymphoblasts which were invading the surrounding tissues. In Cases II and III the primary newgrowth was probably removed completely. There was destruction of the architecture of the lymphnodes by a newgrowth of lymphoblasts, invasion of the capsule, and in Case II, replacement of pre-existing lymphocytes by a more anaplastic type of cell could be observed. In each patient the existence of inflammatory foci was sought for but not found. The blood picture and clinical course eliminated the possibility of leukemia and infectious mononucleosis, and in all three the Wassermann reaction on the blood was negative. In diffuse hyperplastic tuberculous lymphadenitis, the degree of recticulo-endothelial hyperplasia is characteristic.

We are, therefore, forced to the diagnosis of lymphosarcoma. Surgical interference, other than relieving the obstruction, cannot be given credit for a cure in the first case. A mistaken diagnosis or spontaneous regression are the only alternatives. Recently, Taylor[7] in a review of 152 cases of lymphosarcoma of stomach found that thirteen patients were living and well five to twenty-two years after the diagnosis. Seven of them were treated by surgery alone, two by surgery and radiation and four by radiation alone. He concluded that radical surgery was the treatment of choice. It is interesting to note that in one of his patients the surgical incision passed through the newgrowth and yet without radiation the patient is living nearly six years afterwards. Another patient with definite metastases received only 1,380 roentgen units of treatment and has sur-

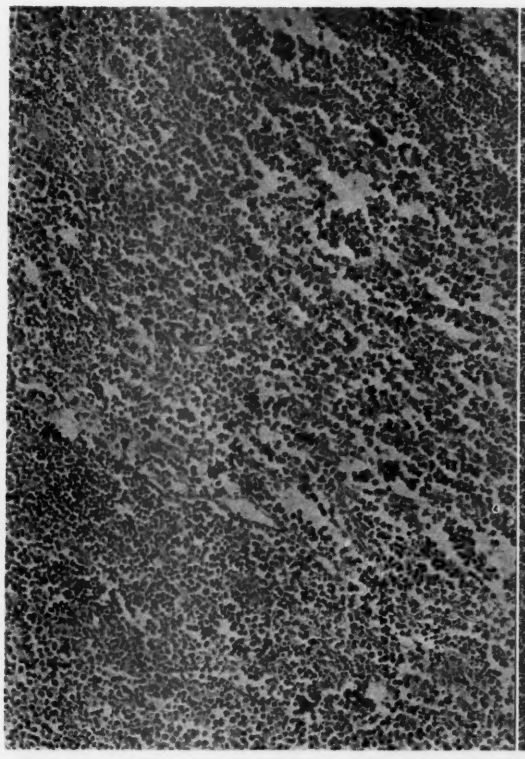

FIG. 3. Case II. Section from lymphnode. Pre-existing lymphocytes are being replaced by a new growth of larger cells which resemble lymphoblasts. The architecture of the node is destroyed. Hematoxylin and eosin stain. × 120.

FIG. 4. Case III. Section from lymphnode. Remains of the original capsule are represented by fibrous strands which have been penetrated by the new growth. Adipose tissue is incorporated in the new growth. Hematoxylin and eosin stain. × 120.

vived seven years. Archer and Cooper[8] found ninety-four additional cases to those of Taylor and in these there were thirteen five-year survivals, one with surgery alone, four with surgery and radiation and eight with radiation alone. He was impressed by the fact that inadequate surgery and radiation have effected five-year cures of lymphosarcoma of the stomach. It seems evident from these recent reports that lymphosarcoma of the stomach not infrequently undergoes spontaneous regression. However, in our other two cases it is possible that the tumor was removed sufficiently early to cure the patient. The absence of recurrences and metastases does not negate a diagnosis of malignancy in other neoplasms and should not in the case of lymphosarcoma. If we consider that lymphosarcoma begins in a single node or closely related nodes, surgical removal, before extension into the surrounding tissues or lymphogenous spread to other lymphnodes, should result in a cure.

SUMMARY

Three clinical cures of lymphosarcoma are reported.

Spontaneous regression occurred in a lymphosarcoma of the stomach, after surgical relief of obstruction.

Surgical removal of early lymphosarcoma of a lymphnode resulted in a cure in two patients.

None of the patients received adequate roentgen-ray therapy.

We wish to acknowledge the courtesy of Drs. W. H. Goodrich, C. D. Ward and P. B. Wright for permitting the presentation of these cases.

REFERENCES

1. Nathanson, Ira T. and Welch, C. E. Life expectancy and incidence of malignant disease. *Am. J. Cancer*, 31: 598, 1937.
2. Jackson, Henry. The classification and prognosis of Hodgkin's disease and allied disorders. *Surg., Gynec. & Obst.*, 64: 465, 1937.
3. Wright, C. B. Hodgkin's disease. *J. A. M. A.*, 111: 1286, 1938.
4. McGovern, Charles W. Lymphatic leukemia of 25 years duration. *Ann. Int. Med.*, 12: 396, 1938.
5. Craver, L. F. Irradiation in the lymphomatoid diseases. *Bull. N. Y. Acad. Med.*, 15: 442, 1939.
6. Hertzler, Arthur, E. Surgical Pathology of the Diseases of the Neck. Philadelphia. J. B. Lippincott.
7. Taylor, E. S. Primary lymphosarcoma of stomach. *Ann. Surg.*, 110: 200, 1939.
8. Archer, V. W. and Cooper, George, Jr. Lymphosarcoma of the stomach: diagnosis and treatment. *Am. J. Roentgenol*, 42: 332, 1939.

THE USE OF ILIAC BONE IN FACIAL AND CRANIAL REPAIR

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CONDITIONS inviting surgical intervention in the cranial and facial areas are attributable to malformation or to injury. We are here concerned with such conditions as relate to loss and displacement in the bony framework of the head.

Malformation, for example, is a congenital condition which applies to the mandible, superior maxillae and nasal bones. The mandible, cheek bones and outer nose are notably susceptible to displacement by impact. Definite losses of bone are produced by other orders of injury. A displaced zygomatic arch may be susceptible of being raised by leverage and the facial contour so restored; on the other hand, in many instances depressions caused by injury can be restored to true surface level only by bone or cartilage replacements or insertions. The level changing material may be artificial, as stent, or it may be cartilage or bone. If bone, there will be need for choice of the donor area. The bone that experience has shown to be best for other areas of repair may not be best here.

What dictates election for one bone substance rather than another is recognition of differences in quality and structure. Bone of notably compact structure is best in some conditions, while cancellous, "spongy" bone is better in others. It is because the ilium is the best provider of "spongy" bone that it presents the most advantages in replacements in facial and cranial repairs.

The general excellence of cartilage is not to be disregarded. It would be the perfect material for many of these repairs were it not for two limitations: One is that it has a tendency to curl, thus producing, in time, a twist that spoils an otherwise perfect job. The other limitation is that it may work loose from an association with bone and create a new distortion. Cartilage has the invaluable property of being lymph nourished. As a lymph supply is present in any situation in which it may be placed, its viability is not impaired by complete detachment from its original surroundings.

Other grafts are less favorably endowed. For example, the free full thickness skin graft has its nerves and vessels put out of action when it is raised; it cannot live without them and must await their restoration. Similarly, bone is nourished by blood vessels whose continuity is interrupted when it is excised.

Bone surface, however, becomes adherent to bone surface by the true adhesion of osteogenesis, whereas cartilage becomes affixed to bone only by a medium of connective tissue; and while over a small area the fixation may be so firm that only by the chisel can it be released, in larger amounts it may yield to displacement by even the mild action of adjacent soft tissues or by its own tendency to curl. The removal of the perichondrium lessens but does not with certainty remove the probability of curling, but no one can foresee what may be the influence of changes in the body chemistry which result, now and then, in some change in the structure of the cartilage tissue. Cartilage inserts will nicely eliminate many a facial depression and restore the surface level; but if it begins to curl, the result is an equally objectionable protrusion. Considerations such as these made it imperative to consider the substitution of bone for cartilage as a more dependable material of repair.

Bone, however, is permeated by blood vessels. Its utility as a transplant is governed, at least to some extent, but its capacity for resuming vascularization. Bone that is best adapted to such restoration commands a preference over bone in which it is less rapid. Uncertainty as to the viability of a bone transplant, for this or other reasons, is expressed in the accepted surgical maxim that, to live, bone must be in contact with bone at both ends of the graft. It must be sustained from within, whatever may be added in the way of sustenance from the tissues that invest it. But when a bone graft lives in contact with other bone, the two become inseparable through osteogenesis. There is no confusion such as is met with when cartilage twists or slips.

Time is an element of importance in the surgery of repair. The longer it takes for a bone graft or any graft to revive, the less is the assurance of success. If the density of the bone is such that it offers resistance to infiltration of blood supply, nothing much can be done to accelerate the process. On the other hand, if the graft is of such composition that vascular return is facilitated, the repair moves rapidly to a successful conclusion. Hence we depart from the broad ground that bone is bone, and seek the source of a supply that will afford, in this direction, advantages that other sources do not. In relation to the repair in the facial and cranial areas, iliac bone does possess this advantage.

It is well to remember that there is much about bone of which we are none too sure.

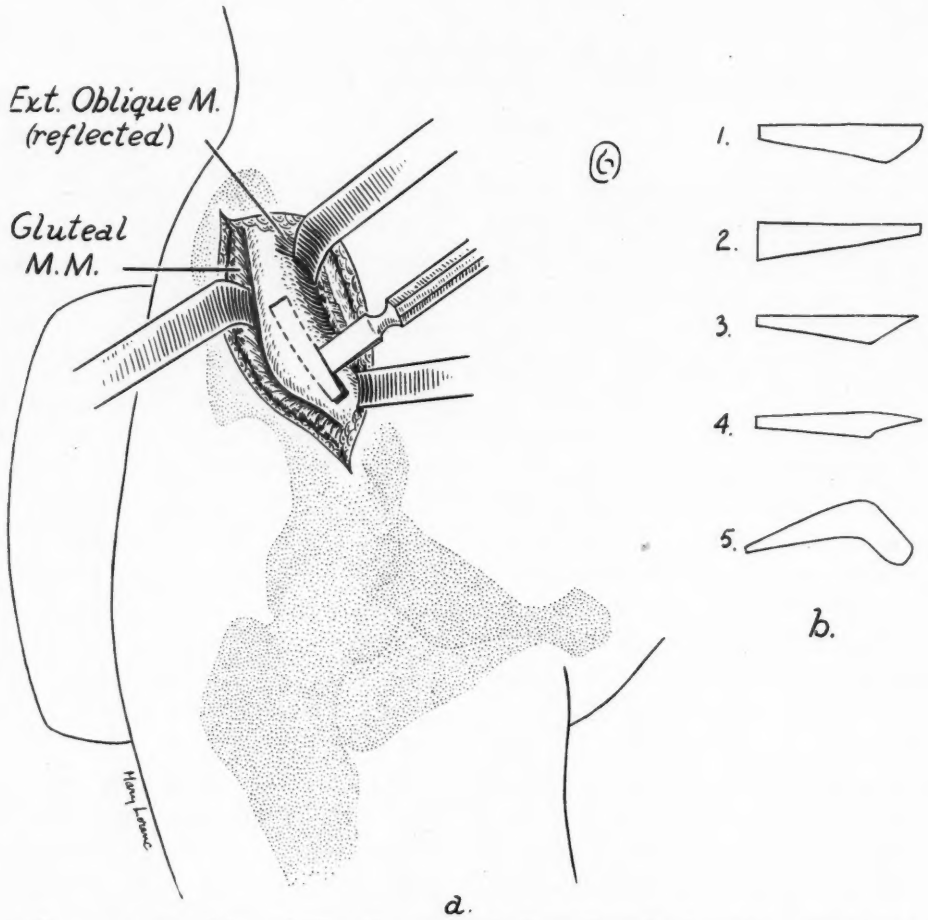

FIG. 1. A, exposition of ilium for removal of small grafts from its outer aspect. B, nasal support grafts. They vary from one and one-fourth to one and three-fourths inches long; one-eighth to one-fourth inch thick.

Conflicting opinions are held by high authorities, who cannot all be right nor all be wrong. There are those who hold that bone growth proceeds from the periosteum, and those who consider the periosteum a mere inclosing membrane whose importance diminishes as it becomes thinner with advancing years. There are some who hold that the periosteum facilitates vascular communication, and others who are committed to the precisely opposite view. There are hard, compact bones, at and just below the surface, with all the strength needed for their special functioning, and there are other bones so placed that there is seemingly less need for strength, and in which cancellous, even "spongy," bone is found in larger proportion, but is just as truly bone as the other.

The question that arises is whether, if the weaker bone is used, it will in the new situation be equal to the demand made upon it; and whether, if the more compact bone is used, it will lose some of its strength because of slow vascular return or for any other reason. As to the periosteum, at least we know that we cannot have it on both sides of a graft. Is the graft, then, better for having it on one side, or can it be dispensed with on both sides without danger of that exfoliation which some consider to be the inevitable consequence of its being withdrawn? In its normal situs, the proportions of animal and mineral constituents of bone are suited to the immediate needs. Will they, or is it necessary that they should, remain in the same proportions in the new situation to which the graft is transplanted?

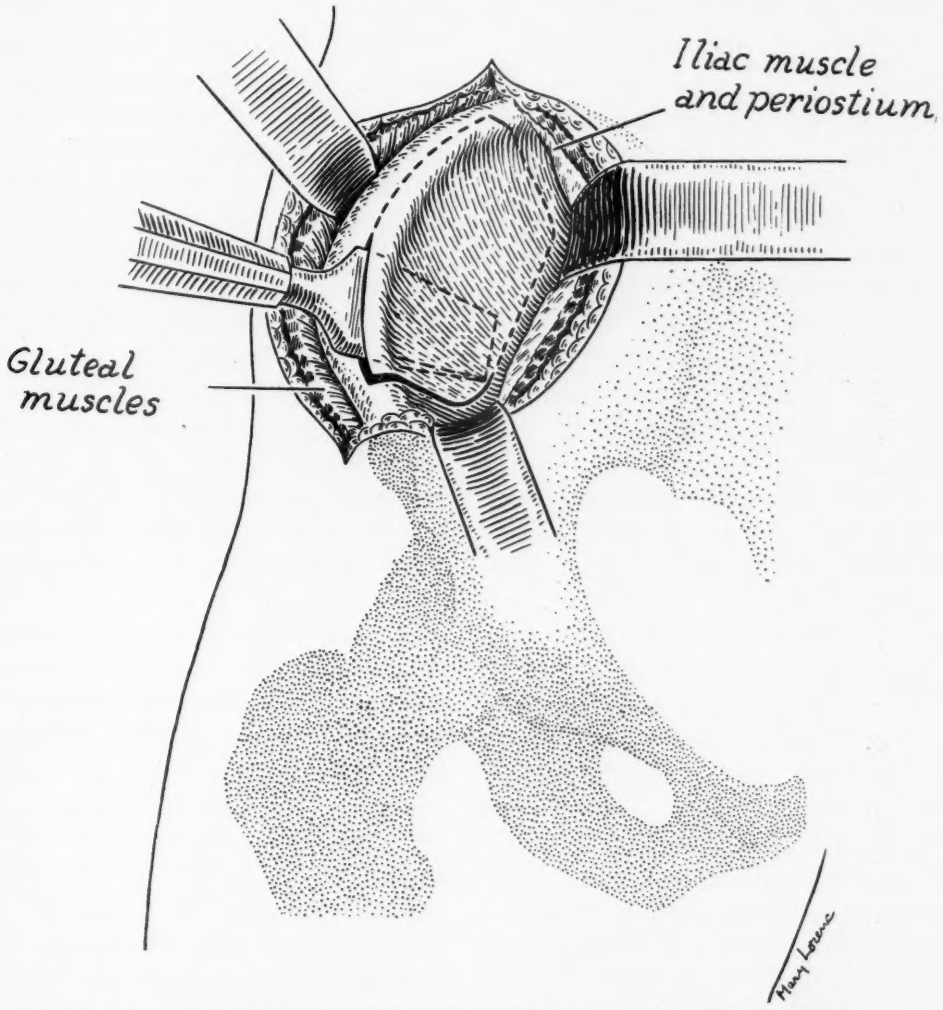

FIG. 2. Removal of bone from inner aspect of ilium to replace large bone losses.

The mineral content may be as high as 70 per cent. Have we the assurance, or do we need it, that there will be no absorption of the mineral content under the new vascular conditions? Even as to the animal constituents we cannot be too sure. There is no certain guide, as yet, to determine how long the cells of bone continue dormant, or how soon they become lifeless. What I do know is that after a bone graft had been in sterile medium for some time I used it to construct a nasal bridge, and after a year there is no sign of its not being entirely adequate. There is still much to be learned from that refinement of the process of trial and error which we call research.

The application of these reflections is indicated if we consider, for example, what happens when we have to do with such a case as that in which the frontal bone covering of the frontal sinus has been crushed in on one side or both. The facial symmetry has been impaired. The surface level has been depressed. In the replacement to restore it there will be no hesitation in preferring bone to cartilage; but in choosing the donor area a controlling consideration will be that the bone graft must be shaped to a form that will restore the esthetic balance of the face. A reminder of the procedure will explain why the operator must ponder the differences between one donor bone area and another.

A plaster cast of the injured area shows the nature of the depression. With a mould of stent, a pattern can be made of the bone implant that will restore the normal contour. With this, after inspection of the bony base, a model of the graft can be fashioned using a piece of bone to be had from the nearest butcher. At once it becomes evident that the graft must be shaped to conform to the curved surfaces of the pattern. No flat, hard bone will serve for this manipulation as well as a "spongy" bone substance will. The curved outline of the ilium and the readily shaped material within that curve at once suggest the best available choice. The only remaining question is whether the transplant of soft bone has the strength that should be provided in that region. Except against violent impact, there is no doubt that the protection is ample.

In other cranial areas, the same considerations apply to filling depressions caused by the bones being crushed in. Where there has been actual loss, or where a surgical defect is to be made and subsequently covered, the advantages offered by the curved iliac bone may not be so impressive. Where protection of the brain is an issue, there can be no rule of thumb. Ordinarily, the borders of such defects are brought to a more or less circular pattern, with half-thickness bone bearings upon which similarly halved edges of the graft will be stepped. A graft of hard bone may serve, but the iliac bone with its curved surface commends irself as an aid to the solution of many such problems.

A fairly familiar effect of pressure injury in the superior maxillary area is the displacement or fracture of the zygomatic arch. If it can be raised by leverage applied from the temporal area, no replacement is necessary; but in some instances there must be such replacement, and, for the same reasons that apply in the frontal area, recourse should be made to the easily shaped iliac graft. It may be mentioned that in such situations the iliac graft displays a resisrance to infection and a capacity for recovery when drainage is necessary, all of which adds to the esteem in which it is held.

Another type of injury is that in which the antrum, the malar bone, perhaps the infra-orbital border, are crushed in, with resultant facial depression. There is little or no prospect of readjusting the depressed structures. One should have recourse to an onlay graft over the whole area with possibly some local replacement in the orbital section. As may be imagined, these extensive onlays inserted below the soft tissues may present postoperative problems, of which infection and the effort to expel are not the least. Here again there appears to be, in the "spongy" bone of the ilium, an

exceptional capacity for surviving these threats with the aid of drainage, that is possessed in lesser measure by the harder compact bone.

The goodly size of many of these onlays reminds one that in certain war wounds, in which the cranial loss is very extensive, the possibility of recourse to the ilium on both sides with the quantity of curved transplants they combine to supply can be a great solace to the operator who has such a defect to deal with, as was my experience when I joined the White forces in the recent war in Spain.

The congenital maxillary deficiency to be observed in the plane next to the dental area does not call for bone graft. Here the correction of level is best attained by a removable dental appliance resting within a buccal inlay.

Transplants to the mandible are used for the purpose of adding to its length. This may be necessary when, after injury, or from congenital inadequacy, dental malocclusion and attendant evils call for some lengthening of the lower jaw. Here a graft of hard bone, as from the tibia, may serve the purpose; but it can be said that the choice might well be the iliac graft, because of its many advantages. This graft includes a curved border that goes nicely with the natural underturn at the lower margin of the mandible and is also readily shaped to adapt it to the "steps" fashioned in the parts it is to hold together. Ability to conform it accurately to measurements made in advance, resulting facility of operation and minimum delay in subsequent coordination with its host, still further commend the iliac graft in these corrections of the mandible.

Advancement of the mandible may or may not be associated with correction of the receding chin. The condition may exist when there is no accompanying dental malocclusion. Independent correction may be effected by introducing cartilage or bone to overly the symphysis in such thickness as will correct the recession and produce an acceptable contour. The difficulty with cartilage is that it may work loose because of the imperfect binding of cartilage to bone by connective tissue. This distortion, since it can be foreseen as possible, is to be averted. A rounded bone graft, united to the mandible at the symphysis, is not subject to such shifting once the osteogenesis has got well under way. It is obvious that, since there is modelling to be done, the easily manipulated iliac bone is not to be overlooked in this correction.

Consideration of the relative advantages in the use of bone and cartilage in reconstruction of the nose opens a somewhat wider field of discussion. We may exclude from it all application to those instances, and they are many, in which the correction can be effected by readjustment of the existing elements. If the nasal bones, though displaced by trauma, can be brought to an arch of proper height, the nasal septum be fitted to continue the line of the dorsum and serve as a buttress for the surrounding tissues, the cartilages of the alae and the columella be readjusted to give form to the nostrils and nose tip and any small depression on the dorsum be filled by morsels excised and saved in this latter process, no question of either bone or cartilage transplant supervenes.

That question does arise when the destruction is so serious that to give form and support to the nose some firm material must be added to the structure. If cartilage is used it must be taken from the costal crest, an undertaking of considerable magnitude surgically for the small amount of cartilage to be taken. Apart from the extensive character of the nerve block and the insult to the tissues, the possible perforation of the pleur sac is to be apprehended. If cartilage can be excluded, resort must be made to bone. The tissues, as a rule, will not tolerate such foreign substances as ivory, silver or gold. In this reparative surgery of the nose the experience with bone in the early years was not encouraging. There was observed a tendency to absorption of the bone substance at the end of the transplant distal from its attachment

at the glabella. That, of course, resulted in a letting down of the tissues at the nose tip, a condition ruinous to the repair. It is probable that, in at least some instances, the bone chosen for the transplant was drawn from sources which surgeons had relied upon in bone grafting of other kinds. Whether the failure was due to the texture of the material chosen or to some other reason, the use of bone in nasal replacement gave way, generally, to the employment of cartilage. The flaw in regard to cartilage was its tendency to twist, to the disadvantage of the line of the dorsum. It is fair to say that this limitation has been more repugnant to the eye of the surgeon than to the majority of such patients as were affected by it, for these are content, in reason, with the improvement over the original condition and do not complain.

Experience gained in recent years in the use of the soft bone of the ilium in transplants in a diversity of other procedures has led to a reconsideration of the earlier decisions. The facility of vascular renewal displayed by this soft, "spongy" bone was something to work with. If this could be depended upon, it appeared probable that such a bone graft would provide an acceptable and durable division wall for the nose and an adequate support for its tissues, if the septum was incapable of serving those uses.

This deduction has been justified by results, but there are some limitations to be noted. There is no problem as far as relates to contact between the transplant and the nasal bones if there are remainders of these last sufficient to establish contact from the glabella to the lower end of the bony arch. If, however, the transplant is carried, unsupported otherwise beyond that last point of contact of bone with bone, it becomes a nice question as to how far the projection should extend. The answer appears to be that if the extension is for only a short distance, the extension derives sufficient sustenance from the main body of the bone; but if the extension is carried too far in the direction of the nose tip, an expedient to which the temptation may be great, the old rule that bone must be in contact with bone at both ends is apt to assert itself, the penalty for overconfidence being absorption at the bone end and drooping of the nose tip. Experience points to an underestimation of the possible security of extension rather than to an assumption of even minimal risk.

The inadequacy of the septum is what leads to this temptation. If it can sustain the line of the dorsum, no bone transplant is needed beyond the end of the bony arch. If, evidently, it is not, the wiser plan is to so shape the bone graft that one end can be given contact with bone at the spine of the maxilla, even if to effect that contact it is necessary to discard some part of the septum. In extreme instances, the bone graft may replace the whole of the cartilaginous septum clear back to the ethmoidal process. In removing part or all of the septum the perichondrium and its investing membrane are spared. Their ensuing contact with the bone are an aid to renewed vascularization. A bony midwall of the nose may not be as pliable as one of cartilage, but the patient will accustom himself to the difference. The iliac graft does, in fact, do well in these conditions. Its surfaces have been observed to take on a cortex that adds to its firmness. There are, it is true, the perils of infection. One may not be be too much surprised if, for this reason, a part of the graft proves to have been absorbed and must be replaced. Here again, however, note is to be taken of the high resistance to infection that the iliac bone seems to possess. Some remarkable instances of this have been within my own experience.

A consideration of importance is that the bone from which the graft is taken is more readily approached than is the costal crest, the source of cartilage grafts. With proper precaution, the graft, if in small quantity, can be taken from between the curved surfaces of the ilium without exposing the patient to much postoperative pain. It is always well to bear in mind that unnecessary insult to the muscles that find attachment to its anterior surface may result in

lameness and in pain; and that the inner surface, which it is sometimes desirable to take, immediately adjoins the peritoneal cavity. And, of course, no one would venture upon intervention without careful provision for the respect that is due to the vessels and nerves.

SUMMARY

The iliac bone presents to those who engage in an intensive effort to perfect the methods of repair of facial and cranial injuries and deformities a definite addition to the resources at their command. Its location, its form, its texture, its proved viability in new situations, its capacity to overcome incipient infection, the relative facility with which it can be shaped, all commend its use. What is more to the purpose, the expectations founded upon these qualities have been fulfilled under the test of experience.

Addition: We wish to add the following biographical notes to the write-up of Dr. Henry Hamilton Moore Lyle, which appeared in our January issue, page 20. Dr. Lyle was appointed to the Field Staff of the Chief Surgeon, First Army in charge of the western section for the evacuation of wounded in the St. Mihiel drive. On September 30, 1918, he was appointed Director of ambulances and evacuation of the wounded of the First Army during the Meuse-Argonne offensive. Dr. Lyle was also Chief Consultant Surgeon of the First Army, a member of the Gas Warfare Board and was appointed A.E.F. Colonel on October 23, 1918.

REBUILDING THE ALVEOLAR PROCESS AND THE BUCCAL SULCUS*

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THE bones making up the jaws have for their principal function that of support of the apparatus by which food is masticated. This function is accomplished through the teeth set in the alveolar ridge which rests upon the free surfaces of the superior maxilla and mandible, respectively. When either ridge is absent through loss of boney tissue, a denture cannot be applied to that jaw in a satisfactory manner for there is nothing to which it may be fixed.

When the teeth are lost, the gums usually retract and fit firmly over the surface, giving sufficient height and rigidity to hold a denture. However, in many other patients the mucous membrane is thrown up into loose, movable, non-rigid, scar infested folds which may or may not be painful. In any event this flaccid condition of the mucous membrane from loss of boney tissue prevents the proper wearing of a comfortable denture. The same effect is produced whether the loss is of the upper or the lower alveolar ridge or both.

The primary treatment of fracture of the alveolar process of either the upper or lower jaw resolves itself into replacing the fragments, if attached to the soft tissues, and fixing them to neighboring solid teeth when the teeth are attached. Fragments of bone which are detached should be removed as they will be thrown off sooner or later and will produce inflammation and local reaction until this takes place.

When the teeth are removed by the usual methods, either simple extraction or surgical removal of the alveolar process, the overlying mucous membrane contains much scar tissue, which usually contracts down over the remaining boney surface. But too frequently this does not occur. In the latter case the mucous membrane is loosely attached and rides the low ridge as a soft, flabby, movable, unstable mass of interspersed mucous membrane and scar tissue. This is an unsuitable base for anchoring a prosthesis. A prosthesis resting on such a low foundation is, in fact, like a house built on shifting sand. Mastication is difficult because of the movements of the prosthesis, especially the great lattitude of its lateral motion.

This unfortunate condition may be remedied by what is believed to be an original procedure:

On May 20, 1935, a patient was referred to me for treatment of this condition. He was about 55 years of age and gave the following history: When a youth he was kicked in the face by a horse following which he lost all of his upper teeth and with them the entire upper alveolar ridge on both sides. The mucous membrane hung down from its boney base as a narrow band of tissue which was soft and flabby. It was readily movable and flaccid. The patient had had, during these many years, a great number of dentures but not one was satisfactory, for having nothing firm to grip they moved about in a most disconcerting manner. Under local anaesthesia he was operated upon.

A small incision or nick was made anteriorly near the region of the former location of the central incisors and an instrument was passed so as to form a pocket in contact with the base of the alveolar ridge between the two apposed layers of mucous membrane and extending from near the median line in front outward and

* Read before the Annual Meeting of the Society of Plastic and Reconstructive Surgery, October 27–28, 1939, New York.

backward to the normal location of the posterior molars. The curve of the boney parts was followed on both sides. A Reverdin perineal needle or similar long curved needle or director may be used for this purpose.

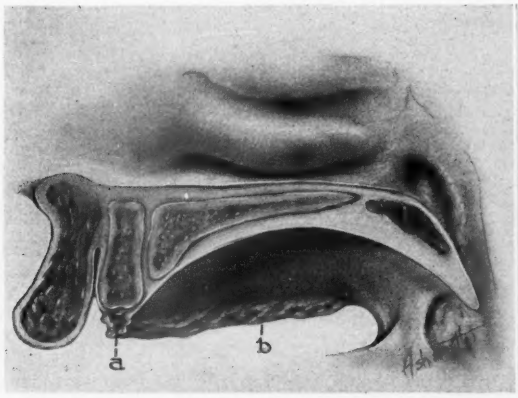

FIG. 1. a, the mucous membrane and its contained scar tissue seen in cross section. b, superficial view of same.

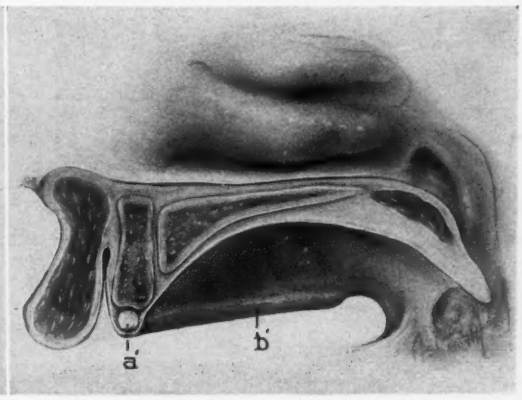

FIG. 2. a', cross-section showing rib cartilage inserted between layers. b', the mucous membrane filled out and "firmed" by the cartilage implant; it will now hold a prosthesis.

A section was cut from the right fifth rib cartilage, long enough to reach the full lengths of the cavities provided and large enough to fill out the contours snugly between the layers of the reflected mucous membrane. The cartilage graft on the left side was about 4 cm. long with a diameter of about 2 mm. That on the right was a little shorter. These cartilage grafts, slightly pointed, were pushed into place in the prepared cavities and at once the mucous membrane and its submucous tissues became rigid and fixed and hugged the alveolar base firmly. The mucous membrane ridges were now not movable. The minute wounds through which the manipulations had been carried out were then closed. Healing of the small incisions took place within a few days. The patient was returned to his dentist with a high, firm ridge that would hold a plate. A new prosthesis was then made which remained firmly in place and was usable. The patient stated that his mouth was now comfortable for the first time since his accident, that the denture held firmly in place and that he could eat without distress. Four years later the condition was still satisfactory, there being no absorption or change in the cartilage implant.

The second case presented an equally interesting but different condition:

The patient was seen September 14, 1934, at the Outpatient Clinic of the University of Oregon Medical School. She had had osteomyelitis of the mandible, following fracture, resulting in an external disfiguring scar and complete obliteration of the lower buccal sulcus on the left side, together with the loss of the six posterior teeth. The floor of the sulcus was on a level with the upper border of the alveolar ridge and it was impossible to fit a denture that would hold its position.

The external skin scar was removed and the wound resutured giving improved appearance. The sulcus was later rebuilt according to the following method:

An incision was made through the crest of a small web at the anterior extremity of the deformity. An instrument was passed between the mucous membrane and periosteum, raising the soft tissues from the latter until a cavity was formed extending back the full length of the normal sulcus. This cavity was enlarged superiorly by incising the submucous tissues, great care being taken that the overlying mucous membrane was not perforated. By this means a cavity was prepared which was sufficiently large to allow the succeeding steps of the operation to be performed. This cavity extended from the periosteum to the submucous layer of the mucous membrane.

The tunnel having been made, a stent or cast of the same was prepared, using dental modeling wax. A Thiersch graft cut from the thigh was then carefully sutured about the wax model with raw surface out, after which the wax model with its skin covering was implanted in the cavity. The wound was then sutured. Twelve days later the superficial sutures were

removed and also the stent. It was then found that a satisfactory long, narrow pocket lined with epithelium had been provided.

Fig. 3. Shows the deep, skin-lined sulcus which will retain a prosthesis.

About three weeks later the roof of this skin-lined cavity was incised thus connecting the new sulcus with the mouth through its full length. This buccal sulcus was deep, long and lined with epithelium. In a few days the overhanging edges retracted and a satisfactory sulcus had been provided, one which would be suitable for the fitting of a plate or other denture which was later accomplished successfully. This operation also gave a permanent result.

These two operations while quite dissimilar in the procedures carried out, were similar in that they both allowed the fitting of prostheses which had been impossible because of lack of sufficient holding surface. The operations are difficult because of certain technical features involved. Operations within the mouth are always carried out in an infected cavity and must be done with a technic which will keep the mouth secretions out of the wound. The carrying out of this technic is aided by the prone position of the patient and by good visibility of the field of the operation. Under proper conditions the mouth of the wound, in either case, may be approached without danger of contamination. It is important that the grafts be sealed in position in a sterile condition and kept so until healing has been entirely completed.

The importance of these operations is derived from the results obtained in the sense of comfort and well being of the patients and their relief from very distressing conditions.

EXPERIMENTAL STUDIES ON THE SOLVENT ACTION OF ETHER ON GALLSTONES*

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THE idea that gallstones might be dissolved by bathing them in a lipoid solvent is not a new one. In 1901, Walker[1] cited a case in which he used an ether glycerine solution to dissolve a stone by irrigation through a sinus leading to the gallbladder. However, the use of ether for this purpose was not generally accepted, nor was further mention made of it until Pribram[2] recorded its use in the removal of the common duct stone in the bad risk case. Best[3] tells of its unsuccessful use in several cases of remaining common duct stone and gives a method of nonoperative treatment which he considers more efficacious.

In an experimental study on dogs with catheters sutured into their gallbladders and their common ducts tied off, Probstein and Eckert[4] found that their animals objected strenuously to the injection of 3 to 6 cc. of ether; they invariably grew listless; their output of bile decreased; some became jaundiced and all died or had to be destroyed. Microscopic study showed progressive destruction of the mucosal lining of the gallbladder and biliary tract and edema of the hepatic parenchymal cells. The dog surviving for the longest period had daily injections of ether for fourteen days.

In a recent résumé of advances in the surgical treatment of biliary disease, Boyce[5] gives ether credit for being a safer agent than Probstein and Eckert have indicated. He cites a very poor risk with acute pancreatitis and acute cholecystitis and a low liver function test in which the use of ether causes no disturbance.

It had been our impression from an experience with two clinical cases that ether might be valuable as an alternative to re-operation:

One of these cases had been operated upon elsewhere and the gallbladder removed. At a second operation by the same surgeon the common duct presumably had been explored for recurring attacks of chills, fever and jaundice with upper right quadrant pain. The progress of the condition had not been changed by the latter procedure. At our operation the common duct was found to be filled with small stones extending up into the biliary tree. When it was thought that all had been removed and a dilating probe was passed easily into the duodenum, the duct was drained. There followed a postoperative period of chills, fever and an obvious blocking of the duct above the catheter, but a free passage of sodium iodide into the duodenum as demonstrated by *x*-ray. Three cc. of ether were injected carefully each day and then the catheter was irrigated with normal saline solution. After several days many small pieces of stone, together with purulent bile, were ejected from the catheter and the patient improved. There were several recurrences of this episode with demonstrable blocking of the duct as shown by sodium iodide injection. Each time the injection of ether relieved the condition and finally the entire biliary tree filled with the opaque medium and the patient had no further difficulty. She left the hospital six weeks after operation with the catheter in place and draining clear bile. Six months after the catheter was removed she had experienced no new attack.

The second case had been operated upon for acute cholecystitis. Her surgeons considered her condition too precarious for exploration of her common duct. She was convalescing from an obstructive resection of the splenic flexure for carcinoma when the attack occurred. She

* From the Department of Surgery, Syracuse University College of Medicine. Aided by a grant from the Thomas F. and George L. Manley Endowment Fund for Research in Surgery

came to our attention when her sinus refused to heal. *X*-ray revealed three large stones containing calcium, i.e., opaque to roentgen ray.

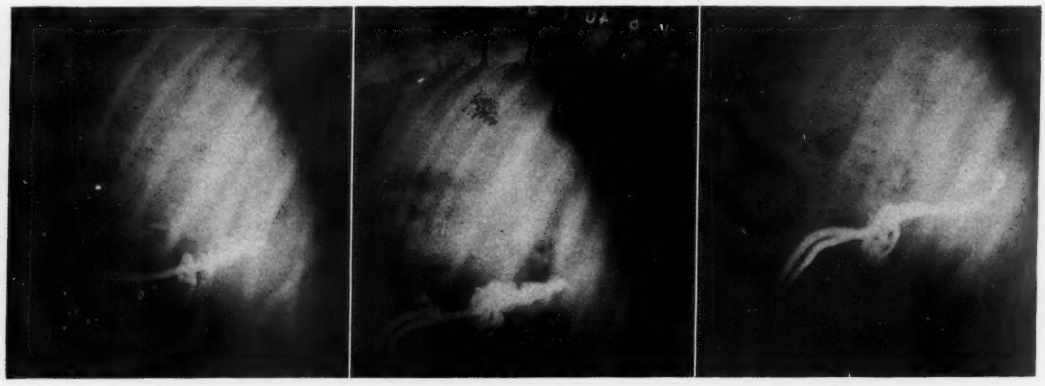

Fig. 1. Fig. 2. Fig. 3.

Fig. 1. Appearance of gallbladder of dog operated five days previously. Thirty stones have been inserted with an ordinary catheter for injection of ether and a Malcotte catheter for the outflow. Twenty per cent sodium iodide solution was used for the radiopaque medium.

Fig. 2. One week later, after daily irrigation with 200 cc. ether. The shadows of the stones are smaller. The gallbladder contains more opaque fluid.

Fig. 3. After two weeks of daily irrigation with 200 cc. ether. The gallbladder shadow is homogeneous. The shadows in the fundus are caused by the fenestra in the Malcotte catheter. Autopsy reveals a few tiny fragments of stones in the head of this catheter.

The sinus tract was gently dilated and a catheter passed down to the nearest stone. After two weeks of irrigation with ether the stone came out of the tract showing definite erosion from the use of the solvent. An injection with sodium iodide solution revealed the location of the other two stones in the common duct. Further treatment with ether gave so much discomfort and had so little apparent effect on the stones that its use was abandoned.

Fig. 4. Gallstones before they were placed in the gallbladder of a dog.

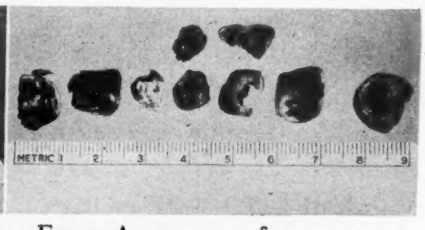

Fig. 5. Appearance of same stones after irrigation daily for a week with 200 cc. ether through a two-way system.

These experiences led us to attempt a study of the solubility of gallstones in vivo. It is a well known fact that only the lipoid solvents, e.g., ether, chloroform, carbon tetrachloride, have any practical value in the rapid solution of cholesterin. Of these, ether is least toxic and probably least irritating. When pure cholesterin stones 1 cm. in diameter are placed in pure ether, they will dissolve in approximately one hour. However, if they are impregnated with even a small amount of calcium, the solubility is greatly decreased. The calcium framework of the stone may remain after the cholesterin is dissolved.

EXPERIMENTAL WORK

For the experimental work fairly large dogs weighing thirty to fifty-five pounds were used. The procedure involved the placing of four or five stones from the same individual in the gallbladder of the dog. They were not opaque to *x*-ray and dissolved readily in ether as determined beforehand by testing in vitro. Into the fundus of the gallbladder a No. 20 F catheter was sutured. After four days, when the dog seemed thoroughly recovered, 2 to 3 cc. of ether were injected slowly and the pressure was quickly released. The dogs

usually objected to the treatment. Occasionally they vomited immediately after the ether was injected. However, they did not seem to lose their health or weight. The stones did not dissolve readily. Worst, of all, it seemed impossible to keep even a mushroom catheter in the gallbladder. Usually, after a week of treatment with 3 to 6 cc. of ether administered slowly twice a day, the catheter would come out and have to be replaced by re-operation. The size of the stones diminished slowly and it was only after four weeks of treatment had elapsed that they showed almost complete disintegration.

During this first period of our experiment it was noted that our greatest difficulty came with the extreme volatility of ether with the resultant pressure created within the gallbladder during injection. At 38°c. and atmospheric pressure (760 mm. mercury) 1 cc. of ether evaporates to form 222.1 cc. of vapor. This fact makes it imperative that there must be immediate release of this pressure if ether is to be injected into the biliary tract. Anyone who has used ether in attempting to dissolve common duct stones has noted that there is upper abdominal discomfort and pain under the shoulder if the ether is not injected very slowly and the pressure immediately released. Dogs object strenuously to ether injection if the above precautions are not taken.

Therefore, in our last ten animals two catheters were inserted into the gallbladder after the stones had been placed. One of these catheters was no No. 20 F mushroom type, the other was a No. 6 F ordinary type. The stones were approximately 1 cm. in diameter and were pervious to roentgen rays. Through the smaller catheter ether was injected beginning three days after operation. The ether came out of the larger catheter immediately. It was found that the animals were perfectly comfortable at all times during the injection and soon a slow, continuous irrigation was set up. two hundred cc. of ether were used for a single irrigation. Some of the dogs received one irrigation a day and others two irrigations a day. The only reaction noted in the animals was an occasional first stage

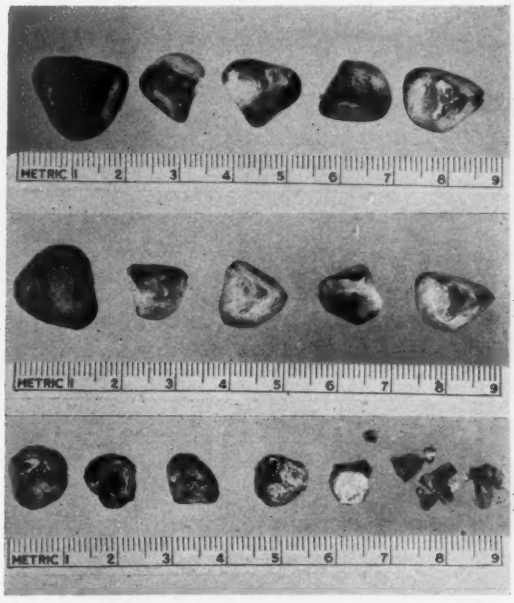

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 6. Gallstones before they were placed in the gallbladder of a dog.

Fig. 7. Same stones after a month in a dog's gallbladder with drainage tubes but no irrigation with ether.

Fig. 8. Same stones after daily irrigation with 200 cc. ether for one week.

anesthesia from the ether which undoubtedly leaked into the duodenum. The dogs ate well and lost very little weight. Weekly *x*-rays were taken of sodium iodide injection of the gallbladder. After one week of treatment the stones would be approximately half dissolved. They appeared eroded and crumbled easily between the fingers. (Figs. 4 and 5.) After two weeks they had disappeared entirely.

Similar stones and a two-way catheter arrangement were placed in a control animal. After one month the stones had not visibly decreased in size nor had they lost their stony character. (Figs. 6, 7 and 8.) We are aware of the fact that human gallstones dissolve slowly in canine bile[6] but do not believe this need to be taken into consideration because of the time factor.

During each experiment it was noted that there was a free flow of bile from the catheters before and after injection of

ether, and the *x*-rays showed the cystic and common ducts patent after two weeks of irrigation with 200 cc. of ether twice a day. (Figs. 1, 2 and 3.)

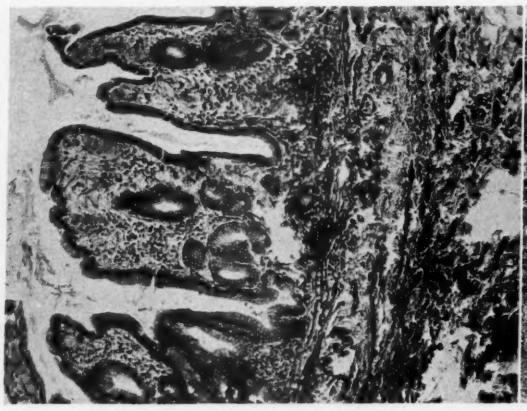

Fig. 9. Microscopic appearance of cross section of cystic duct of dog after two weeks of injection with 200 cc. ether twice daily. × 120.

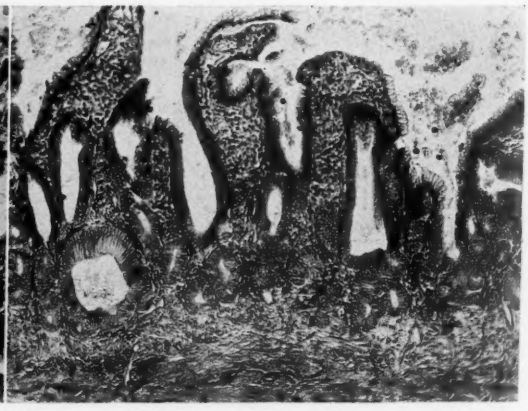

Fig. 10. Microscopic appearance of wall of gallbladder of dog used as control with stones and drainage tubes in gallbladder for two weeks. No ether injected. × 120.

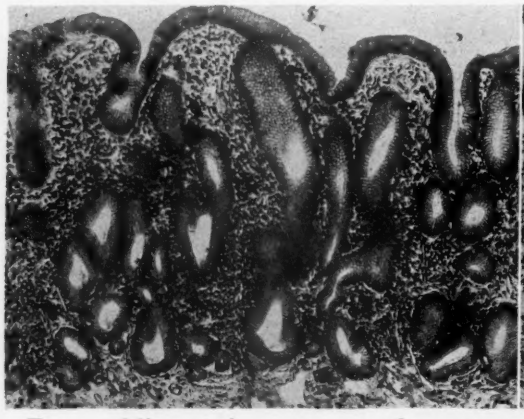

Fig. 11. Microscopic appearance of mucosa of gallbladder of dog in which 3 cc. of ether had been injected twice daily for a month. × 120.

Fig. 12. Microscopic appearance of mucosa of gallbladder of dog in which 200 cc. ether had been injected twice daily for a week. All of these sections show only slight infiltration with leucocytes and no damage to mucosal lining. × 120.

At autopsy there was no gross evidence of liver damage. The reaction about the gallbladder was no greater in those gallbladders injected with ether than that about the gallbladder of the control animal in which catheters and stones were placed but no ether injected.

Microscopically, the mucosa proved to be intact even after a month of exposure to ether, 3 cc. twice daily. There was a little cellular infiltration but scarcely more than that seen in the gallbladder of the control animal in which stones and catheters had been in place for the same period but no ether had been injected. The adjacent liver appeared normal in both dogs.

The gallbladders of dogs subjected to irrigation with 200 cc. of ether twice a day for seven to ten days showed no gross inflammatory reaction. The cystic and common ducts were patent. Microscopically, the mucosa was intact. There was a little infiltration with white blood cells in the submucosal tissues and occasionally a little collection in the muscularis. (Figs. 9, 10, 11, and 12.)

There was no evidence in any of the animals of inflammatory reaction about the gallbladder, ducts or liver sufficiently severe to make a permanent change in the tissue.

CONCLUSIONS

The use of ether in the solution of gallstones in vivo is a slow process and a dangerous one unless provision is made for its immediate exit from gallbladder or ducts through a two-way system.

There is very little inflammatory reaction in the gallbladder or ducts and the liver is not disturbed by the injection of ether if the above precautions are taken.

The use of ether in dissolving gallstones will never replace surgical removal but may be quite helpful, alone or in conjunction with the Best treatment, in removing the stone which has been overlooked if it is discovered before drainage tubes are removed.

I am grateful for the co-operation of Dr. Robert K. Brewer, Dr. J. Howard Ferguson and Dr. G. Gowing Broad in preparing this work.

BIBLIOGRAPHY

1. Walker, J. W. The removal of gall stones by ether solution. *Lancet*, 1: 874, 1891.
2. Pribram, B. O. New methods in gall stone surgery. *Surg., Gynec. & Obst.*, 60: 55, 1935.
3. Best, P. R. Cholangiographie demonstration of the remaining common duct stone and its non-operative management. *Surg., Gynec. & Obst.*, 66: 1040, 1938.
4. Boyce, F. F. Hepatic and biliary tract disease: a review of recent significant advances. *Ann. Surg.*, 109: 351, 1939.
5. Probstein, J. G. and Eckert, C. T. Injection of ether into the biliary tract as treatment for choledocholithiasis. *Arch. Surg.*, 35: 258, 1937.
6. Morrison, Samuel and Feldman, Maurice. Etiology of gallstones: 1. The solvent action of vitamins on gallstones; an experimental study. *Rev. Gastroenterol.*, 4: 120, 1937.

ATLANTO-AXIAL DISLOCATION: REDUCTION BY SKELETAL TRACTION*

REPORT OF A CASE

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MOST injuries to the cervical vertebrae are fractures or fracture dislocations. The vertebrae are so arranged that dislocation without fracture of an articular process or the odontoid process rarely occurs. However, because of the unique anatomy of the atlas and axis, it is possible for them to become dislocated without fracture. This type of dislocation is seldom accompanied by signs of compression of the spinal cord because of the larger dimensions of the spinal canal at this level.

Dislocations and fractures of the cervical vertebrae, with or without injury to the spinal cord, are caused by direct trauma, as in automobile accidents or diving into shallow water, or by indirect trauma, as in suddenly turning the head. Although these lesions are usually traumatic, other types have been reported. Berkheiser and Seidler,[1] among others, reported five cases of spontaneous dislocation resulting from an effusion into the atlanto-axial joints secondary to upper respiratory infection. Coutts[2] had a case of poliomyelitis causing paralysis of the muscles of one side of the neck with subsequent dislocation of the atlas. Brav[3] presented an unusual case of an atlanto-axial dislocation produced voluntarily by the patient.

The incidence of traumatic rotary dislocation of the atlas on the axis is a matter of conjecture, as only a small number of cases appear in the literature. Although most reports consist of isolated cases, larger numbers have been reported by Langworthy,[4] three cases, Rankin,[5] nine cases, Coutts,[2] seven cases, Jackson,[6] four cases and Hudson[7] four cases. In 1927, Jackson[6] was able to collect only twenty-seven cases from the literature. Probably the condition is not quite as rare as these figures indicate.

It is the purpose of this paper to report an atlanto-axial dislocation and to call attention to the value of skeletal traction in its treatment as well as in that of other types of dislocation and fracture dislocation of the neck. In the simple uncomplicated rotary dislocation, reduction can be accomplished without difficulty or danger by skeletal traction. Dislocation rarely recurs in these cases if the neck is immobilized for several weeks following reduction.

The mechanism of atlanto-axial dislocation can be more readily appreciated if the anatomy of this region is briefly reviewed. It will be recalled that the atlas and axis are atypical vertebrae. Attached to the superior surface of the body of the axis is the odontoid process. The atlas, which does not have a body, rotates on the axis using the odontoid process as a pivot. The articular surfaces of the paired atlanto-axial joints lie on a nearly horizontal plane. For these reasons, the only important motion which takes place between these vertebrae is rotation. This type of rotary dislocation was described in detail by Corner[8] as early as 1907. If the head is forcefully rotated too far in one direction, it is possible for an articular facet of the atlas to slip off the corresponding facet of

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the axis. Such a dislocation is unlikely to occur unless various ligaments and the capsule of the joint are stretched or torn.

Clinically, these dislocations produce a characteristic picture. The head is rotated to one side and locked in this position. The superior facet is usually dislocated anteriorly so that the face is turned away from the dislocated side. The head is cocked slightly to the side of the lesion and the neck is slightly flexed. Muscle spasm causes intense pain, which is increased by attempts at active or passive motion. Definite tenderness pervades the area over the second cervical spinous process. Roentgenograms show that the odontoid process is intact but that there is narrowing of the space between the facets on the dislocated side and widening of the joint space on the opposite side.

We submit the following case of unilateral anterior dislocation (without fracture) of the atlanto-axial articulation:

CASE REPORT

B. B., a colored man, aged 37, was admitted to Charity Hospital in New Orleans, June 18, 1939, following an automobile accident. When he regained consciousness about half an hour after being injured, he complained of pain in the neck and arms. The head was rotated about 45 degrees to the right and locked in this position. He was placed in bed with a four-pound weight attached to a canvas head halter.

Three days after admission, when the authors saw the patient, the head was still fixed in a position of rotation. The patient complained of severe pain in the neck and was irrational. He had been unable to tolerate a heavier weight on the traction apparatus. There was neither weakness of the limbs nor retention of urine. The canvas head halter was removed, and Crutchfield tongs were applied to the skull without moving the patient from bed. A twenty-pound weight was hung at the end of the traction rope and pentobarbital sodium was given. Sometime during the night the dislocation became corrected, and by morning the patient was rational and free of pain. The weight was reduced to four pounds.

Check-up roentgenograms showed proper alignment of the atlanto-axial articulations and intact odontoid process. In addition, a fracture of the fifth cervical body was disclosed with slight dislocation between the fifth and the sixth vertebrae. Much of the subsequent treatment was directed toward the latter lesion. The head, neck and upper trunk were incorporated in plaster while maintaining the skeletal traction. The tongs were then removed from the skull and the patient gradually resumed walking. The neck was immobilized for nine months. When last examined on April 29, 1940, the patient's neck was still quite stiff and somewhat painful at night, but in view of the multiple lesions he was told to delay physiotherapy until the first anniversary of his accident.

This case demonstrates several features typical of unilateral anterior atlanto-axial dislocation without fracture of the odontoid process. The head was locked in a position of rotation to the right indicating that the upper facet of the atlanto-axial joint had slipped off the lower facet on the left side. It is noteworthy that the canvas head halter traction not only made the patient extremely uncomfortable but did not accomplish reduction. The dislocation was reduced without discomfort within twelve hours after application of the Crutchfield tongs.

Because of the simplicity of application, the comparative comfort of the patient, the rapidity with which reduction is accomplished and the uniformly good results, we believe that skeletal traction, using the Crutchfield tongs, is the ideal method of treating atlanto-axial dislocations as well as most other dislocations or fracture dislocations of the cervical spine. Open operation is rarely indicated except to relieve delayed cord symptoms. This method of traction has been practiced exclusively on the Tulane Neurosurgical Service since January, 1938. It obviates the necessity of repeated readjustments of a canvas head halter and prevents pain and pressure sores under the chin, which the latter may produce. The older treatment of manual reduction described by Walton[9] in 1893 and Taylor[10] in 1924 is potentially more dangerous because of the possibility of

injuring the cord and should be used only by an experienced individual. As late as 1937 Stookey[11] advocated treating dislocations in this way.

forty-three patients treated in this way. Of this number, fourteen died from spinal cord or associated injuries. Twenty-seven of the remaining twenty-nine were treated either

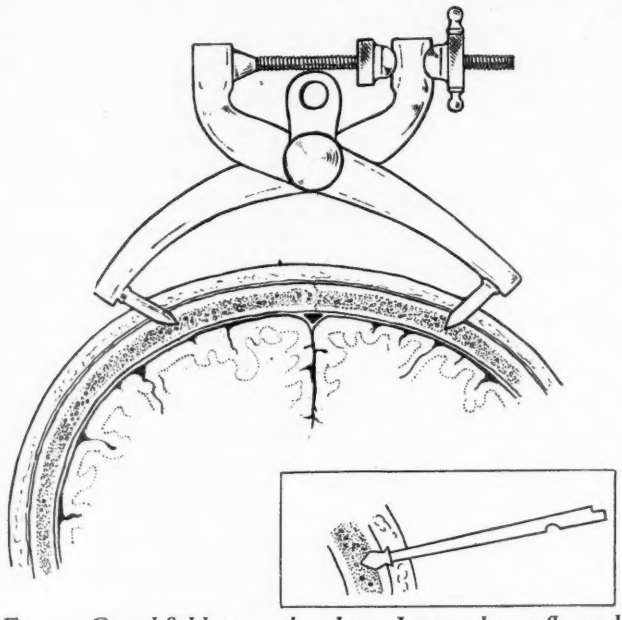

Fig. 1. Crutchfield tongs in place. Insert shows flanged drill which determines depth of hole.

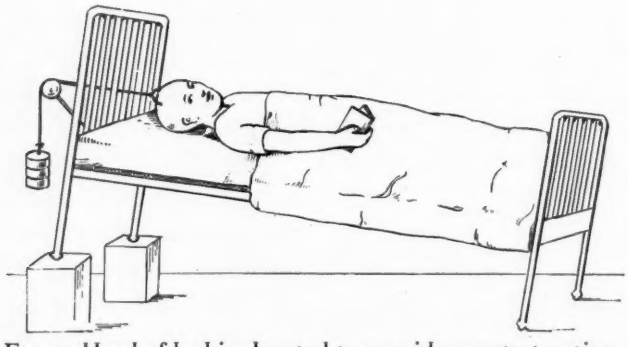

Fig. 2. Head of bed is elevated to provide countertraction.

According to Crutchfield,[12] skeletal traction for reduction of fracture dislocations of the cervical spine was conceived by Coleman,[13] who first used it in his clinic in 1932. Since then, several types of skeletal traction for broken neck have been employed by McKenzie,[14] Hoen,[15] Cone and Turner,[16] Barton[17] and Gallie.[18,19] Other advocates of skeletal traction are Voris[20] and Platt.[21] In 1933, Crutchfield[22] used a modified Edmonton extension tong for this purpose. He perfected his tongs[23] in 1936, reporting excellent results with their employment.[12,24] By 1938, he[25] had a series of immediately or within two months of injury with partial or complete reduction in every case.

The application of the Crutchfield tongs is so simple that it may be done with the patient in bed. (Fig. 1.) The top of the head is shaved and cleaned with iodine and alcohol. Working between the bars of the bed if necessary, the surgeon presses the middle bar and the points of the tongs against the scalp until two dimples have been produced. These marks should be in the coronal plane of the ears. A stab wound is made in each dimple after the injection of

a little novocain. Holes are then drilled at right angles to the surface of the skull. A flange on the drill prevents the possibility of making openings more than 3 cm. deep. The points of the tongs are fitted in place and locked with a set screw. An antiseptic dressing is applied around the prongs. The application of the apparatus does not require more than five minutes. A weight varying from fifteen to thirty pounds is used for traction and the head of the bed is elevated about twelve inches to provide countertraction. (Fig. 2.) Reduction of the dislocation occurs within a few hours and can be verified by examination with a portable roentgen-ray apparatus. The amount of traction may then be reduced to a few pounds. If there is no cord injury, the neck may be immobilized in plaster immediately. If some degree of paralysis is present, it is desirable to leave the tongs in place for several days or weeks. They should be tightened frequently. If signs and symptoms eventually indicate that the cord has been transected, there is no need for further traction nor immobilization.

SUMMARY

1. The anatomy of the atlanto-axial articulation is briefly reviewed.

2. A case of unilateral anterior atlanto-axial dislocation (without fracture) successfully reduced by skeletal traction is reported.

3. Reduction of all types of fracture dislocation of the cervical spine by skeletal traction is advocated.

REFERENCES

1. BERKHEISER, E. J. and SEIDLER, F. Non-traumatic dislocation of the atlanto-axial joint. *J. A. M. A.*, 96: 517, 1931.
2. COUTTS, M. B. Atlanto-epistropheal subluxations. *Arch. Surg.*, 29: 297, 1934.
3. BRAV, E. A. Voluntary dislocation of neck. Unilateral rotary subluxation of the atlas. *Am. J. Surg.*, 32: 144, 1936.
4. LANGWORTHY, M. Dislocation of the cervical vertebrae. *J. A. M. A.*, 94: 86, 1930.
5. RANKIN, J. O. Rotary dislocation of atlas on axis. *Am. J. Surg.*, 32: 27, 1936.
6. JACKSON, R. H. Simple uncomplicated rotary dislocation of the atlas. *Surg., Gynec. & Obst.*, 45: 156, 1927.
7. HUDSON, O. C. Fractures and dislocations of the cervical spine. *J. Bone & Joint Surg.*, 17: 324, 1935.
8. CORNER, A. M. Rotary dislocations of the atlas. *Ann. Surg.*, 45: 9, 1907.
9. WALTON, G. L. A new method of reducing dislocations of cervical vertebrae. *J. Ner. & Men. Dis.*, 20: 609, 1893.
10. TAYLOR, A. S. Fracture-dislocation of the neck; a method of treatment. *Arch. Neurol. & Psychiat.*, 12: 625, 1924.
11. STOOKEY, BYRON. The management of fracture dislocations of the vertebrae associated with spinal cord injuries. *Surg., Gynec. & Obst.*, 64: 407, 1937.
12. CRUTCHFIELD, W. G. Fracture-dislocations of the cervical spine. *Am. J. Surg.*, 38: 592, 1937.
13. COLEMAN, C. C. Operative Surgery, (Horsley and Bigger). 4th ed., vol. 2, chap. 75, p. 1302. St. Louis, 1937. The C. V. Mosby Co.
14. MCKENZIE, K. G. Fracture, dislocation, and fracture-dislocation of the spine. *Canad. M. A. J.*, 32: 263, 1935.
15. HOEN, T. I. A method of skeletal traction for treatment of fracture-dislocation of cervical vertebrae. *Arch. Neurol. & Psychiat.* 36: 158, 1936.
16. CONE, W. and TURNER, W. G. The treatment of fracture-dislocations of the cervical vertebrae by skeletal traction and fusion. *J. Bone & Joint Surg.*, 19: 584, 1937.
17. BARTON, L. G. The reduction of fracture dislocations of the cervical vertebrae by skeletal traction. *Surg., Gynec., & Obst.*, 67: 94, 1936.
18. GALLIE, W. E. Skeletal traction in the treatment of fractures and dislocations of the cervical spine. *Ann. Surg.*, 106: 770, 1937.
19. GALLIE, W. E. Fractures and dislocations of the cervical spine. *Am. J. Surg.*, 46: 495, 1939.
20. VORIS, H. C. Treatment of fractures and dislocations of the cervical spine. *Surg. Clin. N. America*, 17: 543, 1939.
21. PLATT, H. Fractures and dislocations of the spine. *Brit. M. J.*, 2: 1155, 1938.
22. CRUTCHFIELD, W. G. Skeletal traction for dislocation of the cervical spine; report of a case. *South. Surg.*, 2: 156, 1933.
23. Idem. Further observations on the treatment of fracture dislocations of the cervical spine with skeletal traction. *Surg., Gynec. & Obst.*, 63: 513, 1936.
24. Idem. Fracture-dislocation of cervical spine; reduction with skeletal traction. *Indust. Med.*, 6: 65, 1937.
25. Idem. Treatment of injuries of the cervical spine. *J. Bone & Joint Surg.*, 20: 696, 1938.

PARTIAL AMPUTATION OF THE PENIS

A MODIFICATION OF THE STANDARD TECHNIC FOR VENTRAL GROWTHS

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THE proper management of carcinoma of the penis is usually influenced as much by the wishes of the patient

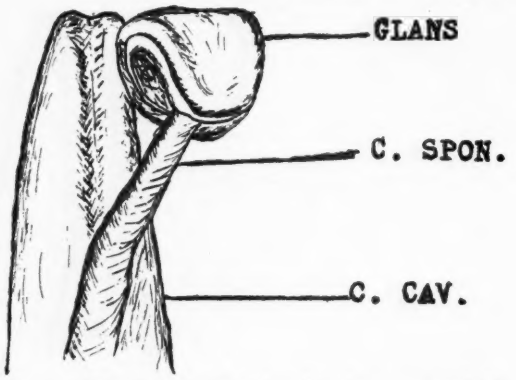

FIG. 1. Dissection of penis, showing anatomical continuity of glans with corpus spongiosum. (From Morris' Human Anatomy, p. 1291. Philadelphia, 1925. P. Blakiston's Son & Co.)

as by the desires of the physician. The results thus becomes a compromise between radical surgery and "noli me tangere." Schreiner,[1] reviewing sixty cases, employed radical amputation and deep therapy as the method of choice; however, the resultant mutilation is abhorrent to the average patient. Dean[2] believes that conservative surgery effectively removes the disease when combined with proper radiation; this view holds with most writers on the subject.

The patient with penile cancer is primarily interested in preserving as much of the organ as possible, even though he imperil his life by so doing. Any operation, therefore, should plan on removing only tissue grossly involved by neoplasm. Pfahler and Widman[3] advocate electrocoagulation of the tumor combined with irradiation and reported 90 per cent of cures. They are of the opinion that irradiation alone, except in very early cases, is not sufficient.

There are certain disadvantages to electrocoagulation: (1) a relatively long period of slough, granulation and regeneration; (2) uncertainty as to the extent of the deeply coagulated tissue, and (3) uncertainty as to the final appearance and function of the organ. Surgery offers a quicker, cleaner and surer result, after the desired amount of irradiation has devivified the cancer cells. Barringer[4] believes that poor results in the past have been due generally to insufficient roentgen treatment rather than insufficient surgery.

DISCUSSION

The standard surgical technic for hemiamputation is aimed at replacing the meatus in its normal distal position. The older textbooks of surgery teach a circular skin incision and a transverse cut across the three bodies of the shaft. Young[5] and Horsley[6] dissect the corpus spongiosum free for a distance of 1 or 2 cm. beyond the amputated corpora cavernosae and cut the stump of the urethra diagonally. Shivers[7] advocates a like dissection, but splits the under surface of the urethra to form a triangle of mucosa at the end of the penis.

Carcinoma of the penis involves the corona of the glans primarily and the usually adherent foreskin. When on the dorsum, the corpora cavernosae may be invaded by contiguity, and the above operations are applicable. However, when the ventral surface is involved, and spread by continuity from glans to corpus spongiosum is insured, the corpora cavernosae would have to be sacrificed much more proximally than demanded by the site of the tumor if the urethra is to be amputated short of the growth yet longer than the

corpora. Figure 1 demonstrates the anatomic continuity of glans and corpus spongiosum.

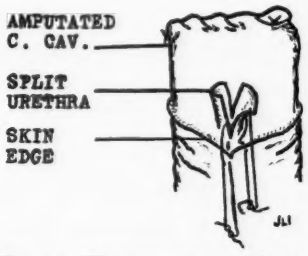

Fig. 2. Tumor area excised. C. cavernosae oversewn and urethra split. Skin suture begun.

There is another factor to be considered, that of the effect of *x*-rays on tissue. After intensive therapy, degeneration and inflammation are common, and healing without contraction depends on delaying the operation until the worst of the reaction has subsided. Even then, some shrinking occurs; and if this be about the meatal opening, stricture of unpleasant proportions impends. This has happened in two cases on the genitourinary service of the Easton Hospital. Young reports only one such case, and Shivers has never had it happen. Thus the practice of cutting the urethra at a different level than the corpora and angling or splitting the end as mentioned above are improvements in the older technic which eliminate constriction.

In the following case, two conditions, i.e., neoplastic involvement of the *ventral* portion of the glans, and degeneration and inflammation secondary to roentgen treatment were met with and handled in a manner satisfactory to both patient and surgeon. The modification of the standard procedures furnishes the basis of this report. The principle is that of *proximal* amputation of the urethra to form an artificial hypospadias, and the creation of a large rectangular suture line at the mucocutaneous junction.

OPERATIVE TECHNIC

A tourniquet is applied to the base of the organ and the skin reflected; a racquet incision, with its long dorsal flap is possible because of the situation of the growth. An Ochsner clamp is placed over the corpora

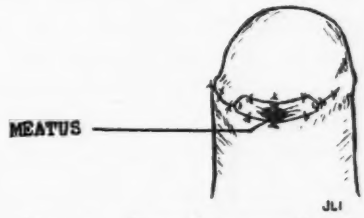

Fig. 3. Operation completed. Dorsal flap of racquet incision covers stump. Arms of split urethra are incorporated in suture line.

cavernosae 1.5 cm. proximal to the corona and the distal portion is severed beyond this. The urethra and attached glans are

Fig. 4.

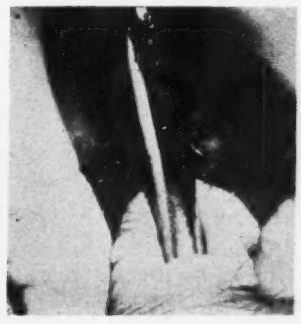

Fig. 5.

Fig. 4. Amputated area, showing lack of scar contraction one year postoperatively. Arms of split urethra can be seen in vertical position.

Fig. 5. An 18A (26F) sound in meatus, showing free passage.

dissected free from this point for a distance of 3 cm. and cut across midway to complete the amputation.

The urethra is split completely to form two mucosal arms; in this case the split was coronal. Figure 2 shows a sagittal cut, which subsequently seemed more logical, and has been used on a later case. The corpora are oversewn, the tourniquet removed and the skin closure made. (Fig. 3.)

Figure 4 shows the operative site more than one year later. The patient has all uses of his organ and has no complaints concerning his mild hypospadias. The meatus readily admits a 26F (18A) sound, and seems to be increasing in diameter with the passage of time.

CASE HISTORY

A. P., a white male, age 42, was first seen December 17, 1937, complaining of a mass at the end of his penis. This consisted of hard, friable tissue involving the right side of the glans, the adjacent prepuce, infiltrating the urethral area, and increasing the head of the penis to approximately twice its normal size. Biopsy proved this a squamous cell carcinoma, grade II. There was very slight right inguinal adenopathy.

High voltage *x*-ray to the local tumor and the inguinal glands was given by Dr. Homer Blaser of the Easton Hospital, and consisted of 12,000 *r* to the penis and 3000 *r* to each groin in less than two weeks. Fourteen months later he received an additional 5250 *r* over both groins, given by Dr. George Pillmore. All was administered by the Coutard method.

The early, intensive radiotherapy resulted in a raw, poorly epithelialized surface over the tumor. Part of this was eliminated by circumcision June 20, 1938, when the electrocutting knife was used; good healing was never achieved. Meatotomy was performed November 16, 1938, because of scar contraction, and had to be done at shorter intervals during the next few months.

Meanwhile, a purulent prostatis developed, causing the patient to feel further below par than at any time. After consultation with Dr. Roscoe Teahan, of Jeanes Hospital, Philadelphia, amputation was done by the above method, and several glands of the right inguinal area removed.

A section of tissue removed both in June, 1938, and February, 1939, showed no evidence of neoplasm. The patient has been well apparently to date.

SUMMARY

1. Judicious combination of intensive radiotherapy and conservative surgery is the best treatment for the average case of cancer of the penis.

2. The classical operation of hemiamputation will occasionally destroy more good tissue than is required by the inroads of the tumor.

3. A modification of technic for such cases, i.e., ventral growths, is suggested; a case is presented using this method.

4. Proximal amputation of the urethra and formation of an artificial hypospadias is the basis of the modification.

BIBLIOGRAPHY

1. Schreiner, B. F. Treatment of epithelioma of the penis, based on a study of sixty cases. *Radiology*, 13: 353, 1929.
2. Dean, A. L. Epithelioma of the penis. Treatment with radium and the roentgen rays. *Arch. Surg.*, 18: 1273, 1929.
3. Pfahler, G. E. and Widman, P. F. Treatment of epithelioma of penis by radiotherapy and electrocoagulation. *Am. J. Roentgenol. & Rad. Ther.*, 21: 25, 1929.
4. Barringer, B. A. Inguinal gland metastases in carcinoma of the penis. *J. A. M. A.*, 106: 21, 1936.
5. Young, H. H. and Davis, D. M. Practice of Urology, 1926.
6. Horsley, J. S. and Biggers, I. A. Operative Surgery, 1937.
7. Shivers, C. H. de T. Personal communication, February 17, 1940.

COMPLETE DISLOCATION OF THE KNEE JOINT*

A REPORT OF SIX CASES WITH END RESULTS

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A COMPLETE dislocation of the knee joint is a rare lesion to which, undeservedly, little critical attention has been paid. Ritter failed to find a single case among 23,000 accident cases at Reconstruction Hospital, and but three cases in the records of the New York Postgraduate Hospital. There are sporadic reports of isolated cases with no follow-up reports, scattered throughout the literature. Conwell and Alldredge reported seven cases with end results in 1937, the first study of this kind. Over a thirteen-year period, we have collected and analyzed from the records of the Metropolitan and Flower-Fifth Avenue Hospitals six cases of complete dislocation of the knee joint without complicating fractures. We believe that while these case reports may not be a new departure in the field, they are a definite contribution to the knowledge of treatment and sequellae.

It is inevitable that the ligamentous structure and the capsular apparatus of the joint should be severely torn, leaving the replaced knee temporarily unstable. The treatment revolves on the anatomic replacement of the bony alignment and a ligamentous repair. A study of the literature in this regard is confusing; advocates of immediate suture-repair of the torn ligaments are equally numbered with those of the more conservative school. The excellent results that we have obtained with our conservative treatment substantiate that of Conwell and Alldredge. The immediate treatment of choice is not a stabilizing operation, but closed reduction, preferably under general anesthesia.

The use of general anesthesia depends upon the elapsed time and the co-operation of the patient, but the important consideration is an immediate replacement when seen by the physician. Five of our patients were treated with a plaster cast for from three to five weeks; two had traction for fractures of the leg (not involving the knee); and one patient had an exploratory operation. No patient had a plastic repair or a suture-repair of the lacerated ligaments. All of the cases had good results. Cubbins, Callahan and Scuderi have described a method of repair for cruciate ligament injuries. In our opinion there is no indication for this until conservative methods have failed and certainly not until the second year of treatment.

ANATOMY

Of the structures stabilizing the knee joint, the following are important: (1) the cruciate ligaments, (2) the tibial and fibular collateral ligaments, (3) the semilunar cartilages and (4) the capsule and surrounding muscles. The cruciate ligaments are anterior and posterior. The former prevents hyperextension of the knee and anterior displacement of the tibia; while the posterior prevents posterior displacement of the tibia, being taut when the knee is flexed. Complete dislocation of the knee causes a complete rupture of one or both of these structures depending upon the direction of force, and this leads to antero-

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posterior instability. The collateral ligaments prevent lateral mobility of the knee. These are torn in a complete lateral dislocation. Fractures of the semilunar cartilages are uncommon in complete dislocations. Operative intervention would, of course, be necessary in such an event.

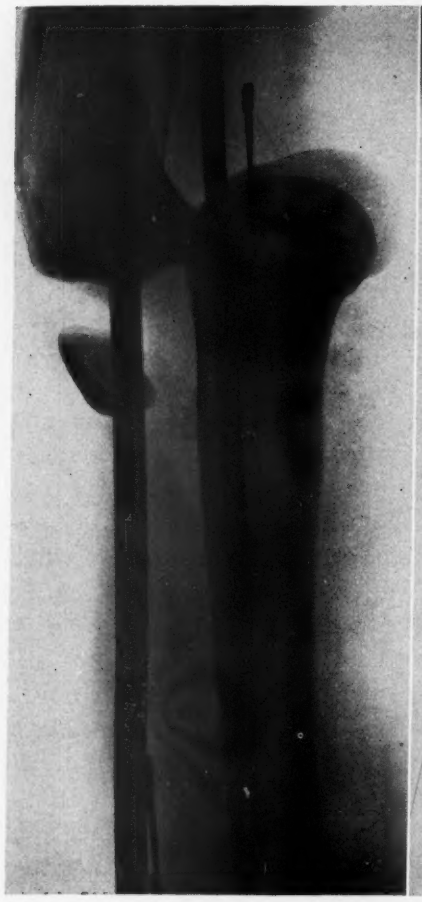

Fig. 1. Anterior complete dislocation of knee; lateral *x*-ray view.

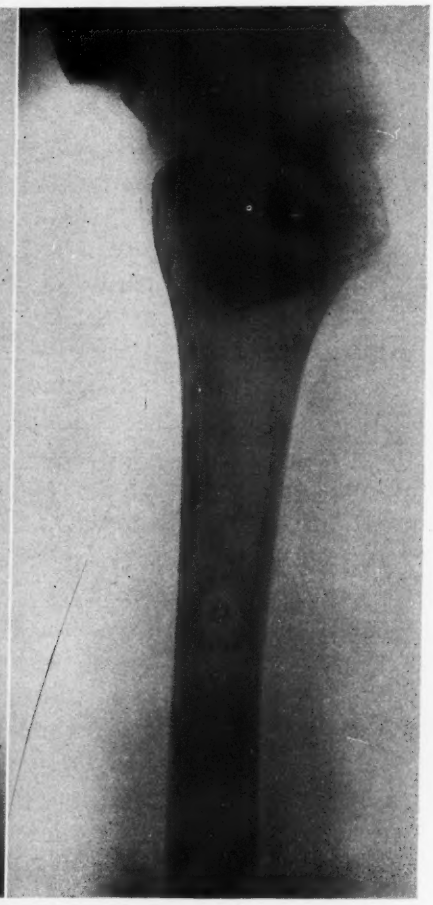

Fig. 2. Same as Figure 1; anteroposterior view.

CASE REPORTS

Case I. H. M., age 18, a male, truck helper, jumped from a speeding truck and was run over by another car. He was admitted at once to the Metropolitan Hospital on August 25, 1937, with a diagnosis of complete anterior dislocation of the left knee, with rupture of the anterior cruciate and both collateral ligaments, comminuted fractures of the middle third of both femurs, fracture of the internal malleolus of the left ankle and traumatic shock. Due to his poor condition, the dislocation was reduced on the ward by traction and manipulation without general anesthesia. Physical examination revealed hyperextension of the left knee joint with increased lateral motion. The tibia slid forward on the femur very easily. Russell traction was applied for treatment of the femur fractures, until October 6, 1937. The patient was up on crutches on October 10 and left the hospital on October 20, 1937. He was seen at the follow-up clinic on December 17, 1937. At this time there was no limited motion at the hip, knee or ankle. On January 19, 1938, the patient complained of a slight buckling of the left knee once or twice a day. An elastic knee support was prescribed. The patient was last seen on March 4, 1938. At that time, physical examination showed no lateral motion and there was no limitation of function. He had resumed his former occupation as helper on a milk truck several months previously. The knee joint no longer buckled.

Case II. E. R., a male, white, accountant, 63 years of age, was struck by an automobile on the lateral side of the right knee on the day before admission. The ambulance surgeon

found a complete lateral dislocation of the right knee which he reduced. He was admitted to the Flower-Fifth Avenue Hospital on September 27, 1934, with a diagnosis of complete lateral dislocation of the right knee, laceration of the capsule, and laceration of the right medial collateral and the cruciate ligaments. Physical examination revealed a massive effusion into the joint with an ecchymosis over the inner aspect of knee. This was soft, fluctuant and painless. The patient had no pain or tenderness on admission. The knee could be completely subluxed at will. The *x*-rays were negative for fracture. On September 27, 1934, the patient was given a general anesthetic and the knee joint explored. The internal lateral ligament was found to be completely torn. The capsule was lacerated for two inches. On opening the latter, the semilunar cartilages were intact, but the cruciate ligaments were completely torn at their insertions. The wound was irrigated and the capsule sutured with chromic catgut No. 2. The skin was closed with black silk. A circular cast was applied from groin to ankle. On removal four weeks later, physiotherapy was started at the clinic. When seen on September 21, 1939, the patient had been working for three years without any difficulty with the knee. There was no lateral or anteroposterior instability and no limitation of motion at the knee.

FIG. 3.

FIG. 4

FIG. 3. Photograph of both legs, anteroposterior view showing complete anterior dislocation.
FIG. 4. Lateral view of same patient shown in Figure 3.

CASE III. M. W., 23 years of age, a male, chauffeur, slipped and fell on the right knee while intoxicated. He was admitted to the

Metropolitan Hospital on December 25, 1925. On physical examination, the right knee was painful on motion in all directions. The condyle of the tibia was displaced backward with distention of the posterior popliteal fossa. The diagnosis made was complete posterior dislocation of the right knee. Reduction was performed under general anesthesia by means of traction and manipulation. A circular cast was applied from the groin to the ankle. This was removed in three weeks and the patient walked without disability. He was discharged one week later, asymptomatic and in apparent good condition. Examination made three months later of the right knee showed good anteroposterior and lateral stability with unlimited function and no pain. The patient had returned to his former occupation one month before.

Fig. 5. Anteroposterior view of *x*-ray showing knee reduced. Note that there are no fractures.

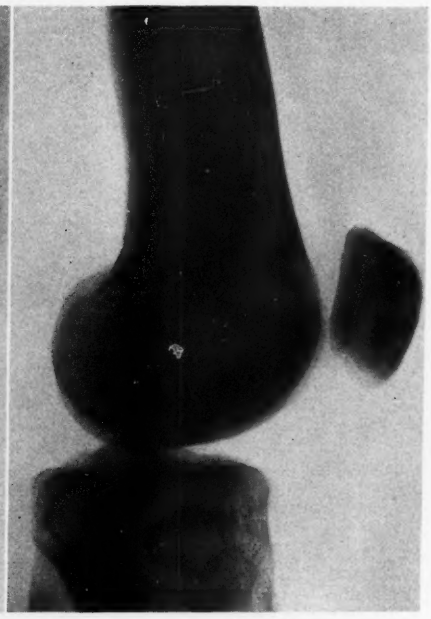

Fig. 6. Lateral view of same patient shown in Figure 5.

Case iv. F. S., a male peddler, 22 years of age, was struck from behind by an auto and was admitted to the Metropolitan Hospital on August 8, 1936, with a diagnosis of complete anterior dislocation of the right knee, comminuted fracture of the middle third of both bones of the right lower leg, transverse fracture of the upper third of the left fibula, cortical incomplete fracture of the upper third of the shaft of the left femur and catarrhal jaundice. Physical examination revealed inability to move the knee or hip joint of both limbs and inability to lift either heel from the bed. The right tibia was displaced anteriorly on the femur. The patella was intact. Crepitus and abnormal motion were elicited over the mid-shaft of the right lower leg. Under general anesthesia, the dislocation was reduced and a Steinman pin inserted through the os calcis for skeletal traction of the leg fracture. On September 14, the traction was discontinued and a plaster cast applied from groin to toes (right leg). The cast was removed on October 21. One plus motion was found at the fracture site. Despite stiffness of the knee found at this time, it was necessary to incorporate it in the new cast because of the fracture. A bone drilling for delayed union was done on December 10, 1936, and a plaster cast reapplied. In March, 1937, the last cast was removed. The patient was seen again in the follow-up clinic two years later on December 10, 1938. He had been driving a milk truck regularly since August, 1938. There was one inch atrophy of the muscles of the right thigh. Flexion of the knee was possible to 105 degrees and there was no lateral motion. The right tibia could not be displaced upon the femur. The right knee joint was painless.

Case v. W. M., male laborer, colored, 35 years of age, stepped off a curb and twisted his left knee inward. He was admitted to the Metropolitan Hospital on November 18, 1931. Physical examination revealed the left knee to be slightly swollen and tender with exquisite

pain on attempted motion. A diagnosis of complete medial dislocation of the left knee was made and confirmed by *x*-ray examination. Reduction was obtained by traction and manipulation under general anesthesia and a plaster cast was applied from the groin to the ankle. The patient was discharged on December 23, 1931, after having had the cast on for four weeks. On leaving the hospital, he had no lateral motion, no pain or tenderness and no limitation of function in the left knee. He was seen one month later in the follow-up clinic and was ready at that time to return to work.

Case vi. P. S., 21 years of age, a male, laborer, was asleep as a passenger in the front seat of an automobile which collided with another car. He was admitted to the Metropolitan Hospital on November 5, 1937, with a diagnosis of complete anterior dislocation of the left knee, rupture of both cruciate ligaments and of the medial collateral ligament. Physical examination revealed the knee fixed in full extension, and the calf in a plane with the anterior surface of the thigh. The upper end of the tibia could be palpated anteriorly. The skin of the popliteal space was tense, but the hamstrings and the femoral condyles could be palpated. The dislocation was reduced under intravenous evipal and a circular cast applied from groin to ankle the same day. The patient was discharged on crutches with the cast in place on November 12, and readmitted November 27, after he had fallen down, broken the cast and partially redislocated the knee. A new cast was applied and the patient discharged. He was not seen until one year later. At this time he had complete use of the knee with no lateral motion and no anteroposterior displacement. There was no limitation of function and no pain. The patient had returned to work several months before. (In the interim the cast had been removed in the clinic and physiotherapy treatments had been given.)

SUMMARY

1. Six cases of complete dislocation of the knee joint are presented with end results. No patient had a plastic repair. One patient had an exploratory operation, but the wound was closed when the semilunar cartilages were found to be intact. Two patients were treated with traction due to fractures of the upper or lower leg but not involving the joint. Five patients were treated with plaster casts. All were seen early and reduced immediately.

2. Four patients had a general anesthesia. One did not because he was in shock.

3. Three were cases of anterior dislocations; one was lateral, one medial and one posterior.

4. Five patients ranged from fifteen to thirty-five years of age. One was sixty-three years old and all were males.

5. All the dislocations were complete. Each had a good result on leaving the hospital and in the follow-up period, with spontaneous repair of the internal ligaments of the knee.

REFERENCES

1. Conwell, H. E. and Alldredge, R. H. Complete dislocations of the knee joint. *Surg., Gynec. & Obst.*, 64: 94–101, 1937.
2. Cubbins, W. R., Callahan, J. J. and Scuderi, C. S. Cruciate ligament injuries. *Surg., Gynec. & Obst.*, 64: 218–225, 1937.
3. Fichman, A. M. Complete lateral dislocation of the knee joint. *J. A. M. A.*, 105: 1111, 1935.
4. Gray's Textbook of Anatomy. Philadelphia, 1938. Lea and Febiger.
5. Ritter, H. H. Dislocation of the knee joint. *J. Bone & Joint Surg.*, 14: 391–394, 1932.
6. Stellhorn, C. E. Complete dislocation of the knee joint. *Am. J. Surg.*, 26: 332–333, 1934.
7. Weigel, E. W. Complete dislocation of the knee. *Am. J. Surg.*, 9: 140–141, 1930.

LINGUAL THYROID*

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IN the process of fetal development the thyroid gland is developed from a median diverticulum which appears about the fourth week on the summit of the tuberculum impar, but is later found in a furrow immediately behind the tuberculum. It grows downward and backward as a tubular duct, which bifurcates and subsequently divides into a series of cellular cords, from which the isthmus and the lateral lobes of the thyroid gland are developed. The connection of the diverticulum with the pharynx is termed the thyroglossal duct, its upper end being represented by the foramen cecum of the tongue and its lower by the pyramidal lobe of the thyroid gland.[1] The thyroglossal duct is divided into upper and lower portions, the lower extending from the hyoid bone to the pyramidal lobe of the thyroid gland. While the thyroglossal duct usually passes behind the hyoid bone, it may be situated in front of or pass through the substance of the bone itself, a condition made possible by the later fetal development of the hyoid bone. These various courses of the duct justify consideration of the surgical treatment of conditions involving the tract.

Not infrequently does the thyroglossal duct remain patent from the isthmus of the thyroid to the foramen cecum. With faulty descent of the thyroid from its site of origin the gland may be situated, in whole, or in part, anywhere along the course of the duct. (Fig. 1.) When this occurs at the foramen cecum, it results in the development of a lingual thyroid. Portions of the gland may be arrested in its descent in the substance of the tongue producing an intralingual thyroid or at its base where a sublingual thyroid is formed. A prelaryngeal thyroid is seen when this process takes place in front of the larynx below the hyoid bone. Going downward the gland is next found in its normal situation anterior to the cricoid cartilage and the upper tracheal rings. Finally, there may be additional masses of thyroid tissue in the retrosternal area, located in the superior mediastinum, as a result of the downward projection of cells from the gland in its normal situation.

Since 1866[2] there have been reports of tumors seen on the posterior surface of the tongue which have been accepted as lingual thyroids. Dr. M. Lawrence Montgomery[3] reported 144 cases gathered from the literature between 1888 and 1935. Bronson S. Ray[4] after a complete study of the reported cases states that there are about 250 cases in the literature. The rarity with which a lingual thyroid is encountered added to an unusual interest in this lesion and stimulated by the fact that we recently cared for such a case, prompts the submission of this report to surgical literature.

It is self evident that this type of thyroid is existent from birth. The greater percentage of the reported cases occurred in females and were brought to the patient's attention by the physiologic enlargement of the gland associated with puberty and in some cases during pregnancy. Some female patients noted a definite enlargement of the lingual thyroid during menstruation. Enlargement also followed operations for ovarian cysts.[5] Following thyroidectomy there has been a compensatory enlargement of the accessory lingual thyroid.[6] In

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younger patients, if the gland on the tongue is small, it may be accidentally discovered, or if increasing in size, may so interfere with swallowing as to impair nutrition. Dyspnea may be an outstanding complaint or there may be a disturbance in phonation.

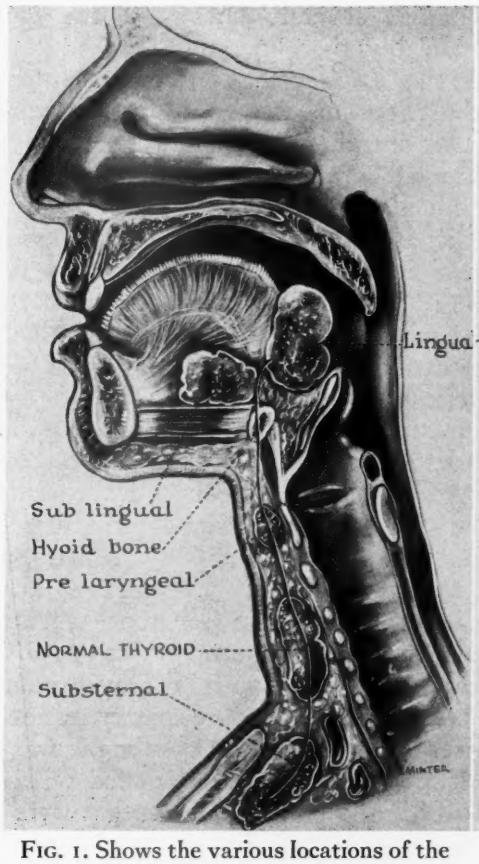

FIG. 1. Shows the various locations of the thyroid gland and also the abnormal locations of thyroid tissue.

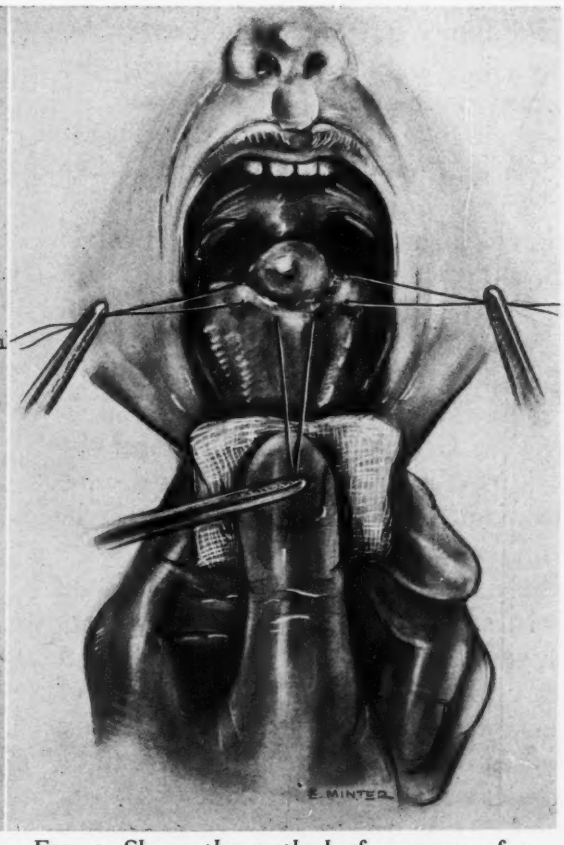

FIG. 2. Shows the method of exposure of a lingual thyroid gland and the scheme for control of hemorrhage.

Grossly, the lingual thyroid is seen to be situated in the midline of the tongue, anterior to the epiglotis and in the region of the foramen cecum. It is found to be a single tumor, covered by the mucosa of the tongue with a smooth or lobulated surface and somewhat globular in shape. It usually possesses a broad base through which it receives a copious blood supply to influence the color of the gland which may be anything from a light pink to a deep red. Cases are reported in which the lingual thyroid has been found at the end of a pedicle.[7] These tumors may vary in size, being as small as a pea or large enough to fill the pharynx. It is reported that in 70 per cent of the cases the thyroid in the neck is absent, a fact, which calls for consideration before surgical treatment is instituted.

The lingual thyroid usually is found to give a histologic appearance of normal thyroid tissue. But the growth may be affected and show any of the changes seen in the thyroid in its normal situation, such as, cysts, adenomas or malignancy. If the secretory function of the gland is altered, its host may exhibit a clinical picture seen under such conditions. Toxic symptoms from hyperactivity occur and, on the other hand, cretinism and myxedema have been seen. These conditions, however, are in the minority.

It is easy to understand that there may be no symptoms associated with this condition, particularly, if the growth is small. If the growth is larger, it is so located as to be traumatized frequently during deglutition and give rise to hemorrhage which Bronson

S. Ray[4] states occurred in varying degrees in 10 per cent of the cases reported. The patients complain of a fullness in the throat and difficulty in swallowing, breathing and talking. Following trauma there may be ulceration and occasionally pain and the breath may have a fetid, offensive odor.

Before surgical removal of the lingual thyroid is effected the existence of other thyroid tissue should be confirmed. Since palpation of the normal gland in the neck is sometimes very difficult, exploration of the neck can be done quickly and with safety. Extirpation of the lingual thyroid is justified when there is enlargement sufficient to interfere with breathing, speaking or swallowing, hemorrhage, degeneration and necrosis, hyperthyroidism which does not yield to medical treatment and in cases in which malignant change is suspected.

In the absence of other thyroid tissue subtotal removal of the lingual gland has been suggested. This has been done in a number of instances and the incidence of recurrence is small. However, if the entire gland is removed the patient's needs can be satisfactorily met by the administration of thyroid extract, the dosage being determined after periodic elicitations of the basal metabolic rate. This latter test should be done before operation and at regular intervals thereafter. Attempts to transplant some thyroid tissue have not been highly successful. It is difficult to remove tissue from such an infective area as the mouth and obtain a successful graft.

CASE REPORT

A girl, three and one-half years old was referred to us by Dr. Ralph Venturo, Glassboro, New Jersey. Her parents had discovered a lump in her mouth in the first week of January, 1940, upon looking down her throat after she had been hoarse for a number of days. She was undernourished and small for her age. Before her parents discovered the growth the child would say, "Mamma, I have throat" in an apparent effort to say that she had something in her throat. From the time she was able to talk she would complain that anything even if lukewarm was too hot. The child was taken to several physicians who made no specific recommendations. The mass enlarged rapidly during the two weeks preceding admission, hoarseness became more pronounced, vomiting occurred several times and the child was noticeably more nervous. She was admitted to the Brewer Hospital, Woodbury, New Jersey, and operated upon February 22, 1940. Ether anesthesia was used. The child was discharged three days later and made an uneventful recovery. A basal metabolic rate was done on March 16, 1940, and was −20. Thyroid extract—gr. 1—daily, was given and the B M R. repeated on April 26, 1940, showed it to be −12. The first month after operation she gained two and one-half pounds. Her nervousness had diminished, she can now tolerate hot foods, swallowing is not disturbed, hoarseness is absent, she makes no reference to anything in her throat and she is assuming the appearance of a normal girl of her age. The last B. M. R. done on May 28, 1940, was −7.

Operation. Under deep ether anesthesia, using an ether tip and a tonsil suction apparatus a transoral operation was done. The jaws were held open with a Davis mouth gag. Following a procedure patterned essentially after Lahey's method[8] the tongue was grasped between the fingers and pulled well forward. Sutures of No. 1 chromic catgut were inserted into the tongue lateral to the growth and anterior to it in the midline. (Fig. 2.) Traction was made on these sutures to deliver the growth further and to control hemorrhage. The mass was then excised with an elliptical, wedge-shaped incision. Bleeding points were clamped, ligated and the edges approximated with mattress sutures. Convalescence was uneventful.

Pathologic Examination. "Grossly, the specimen consists of a small tumor mass 25 cm. in diameter. It is covered on one side by smooth, glistening epithelium which contains a few papillae. There is one depression which leads to a blind duct, measuring about 2 mm. long. The tumor itself is light brown, moderately firm, glistening, somewhat gelatinous and with a tendency to cyst formation."

Histology. "Section consists of a small piece of tissue from the base of the tongue. It is a fairly well circumscribed nodule and is characterized by a number of acini. These acini are filled with colloid. The lining epithelium is low cuboidal in nature, the colloid is deep staining. In other areas there is considerable mucinous-

like tissue and some hyperplasia of the lining cells. In some instances, the cells are swollen and filled with colloid like material."

Diagnosis. "Aberrant thyroid tissue."

SUMMARY

1. Another case of a lingual thyroid is reported to surgical literature.

2. Before the surgical removal of a lingual thyroid is effective the existence of other thyroid tissue should be confirmed. However, if the entire gland is removed, the patient's needs can be satisfactorily met by medical therapeutic measures.

3. A transoral operation for the removal of a lingual thyroid is described.

REFERENCES

1. Gray's Anatomy.
2. Hunt, W. Tumor of the posterior portion of the tongue. *Am. J. M. Sc.*, 51: 163, 1936.
3. Montgomery, M. L. *West. J. Surg.*, 43: 661, 1935; 44, 1936.
4. Ray, Bronson S. Lingual thyroid. *Arch. Surg.*, 37: 316, 1938.
5. Beck, J. C. Surgery of the tongue. *Ann. Otol., Rhinol. & Laryngol.*, 27: 27, 1918.
6. Cited from Ray.[4]
7. Bishop, F. J. Lingual thyroid. *Ann. Otol., Rhinol. & Laryngol.*, 43: 294, 1934.
8. Lahey, F. H. Lingual goitre. *Surg., Gynec. & Obst.*, 36: 395, 1923.

Correction: It was erroneously stated on page 11 in our January issue that Dr. Meredith F. Campbell was President of the American Urological Association. It should have stated that he is President of the New York Section of the American Urological Association.

MODIFICATION OF THE MUNRO TIDAL DRAINAGE APPARATUS*

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WHEN Munro first presented his conception of tidal drainage of the urinary bladder in 1934, it apparently was not evident to the urologists discussing the paper that this method of treatment had urologic significance. However, it was soon discovered that this was a valuable and dependable addition to their therapeutic armamentarium, and modifications of the original apparatus for special cases were devised.

We wish to present two such modifications: the first having very general application and the second a very limited one. Tidal drainage was first utilized by the urologist for the treatment of cystitis, particularly in those obstinate cases which did not respond to recognized measures. The value of the treatment lies in the regular, automatic distention and irrigation of the bladder. With the original apparatus, the reservoir and tubing had to be filled at each cycle before any fluid entered the bladder, and the evacuation of the viscus was sometimes incomplete. It was evident that with constant irrigation the modality would be more effective. For this purpose, the modification shown in Figure 1 was devised. Essentially, it consists of a two-way catheter with tidal drainage apparatus attached to the outflow. All the fluid entering the apparatus must first pass through the bladder. Actual tests have shown that a solution of indigo carmine will be cleared from the bladder in half the time that is required with ordinary tidal drainage. This modification is valuable in the treatment of all types of cystitis, but particularly so when the urine is markedly infected or when incrustations are present, and permits the use of any of the medicinal solutions now in use.

DESCRIPTION OF APPARATUS

The fluid is placed in the container, *A*, from which its rate through the dropper, *C*, is controlled by clamp, *B*. It then flows to the intake of a two-way catheter, *D*. Fluid leaves the bladder by the outflow of a two-way catheter, *E*, and flows into the reservoir, *G*, through a small glass tube, *H*. After the reservoir is full, the fluid will rise in the vent, *F*, and siphon arm, *I*. When the intravesical pressure is greater than that in the siphon arm, siphonage takes place, emptying both the bladder and reservoir into the waste bottle, *J*.

Because the reservoir, *G*, is drained by a smaller tube and is lower than the bladder, it will empty more slowly than the bladder. When the reservoir, *G*, is empty, air will be drawn through the air vent, *F*, thus breaking the siphonage and permitting the filling cycle to recur.

When assemblying this device, care must be taken that the reservoir is lower than the patient, and that it is drained by a smaller tube than that draining the bladder. This is to insure emptying of the reservoir after the bladder is empty. Also, the apparatus will work better when the tube connecting the bladder to the reservoir is on a gradual downhill slant.

Cystometrograms will be found superfluous if this apparatus is started in the following manner: The siphon arm, *I*, is raised considerably above its final expected level and dropper, *B*, so adjusted that the fluid is running at the desired speed, usually sixty to ninety drops per minute. When the

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fluid in the air vent, *F*, reaches the level of the bladder, a marker is placed on the reservoir, *A*. The fluid is permitted to flow and readings taken at each 50 cc. until the bladder capacity is reached. In the average, this is about 300 cc., but in many diseased bladders, it may be considerably less or more. To institute treatment, the siphon arm is lowered to the level where the siphon will work and it is fixed there. As the bladder capacity improves, the siphon arm will require readjustment. The strength of the detrussor muscle and restoration of normal bladder function is accelerated by increasing the pressure slightly.

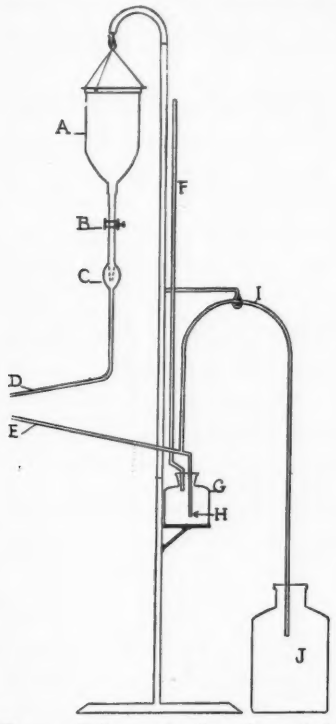
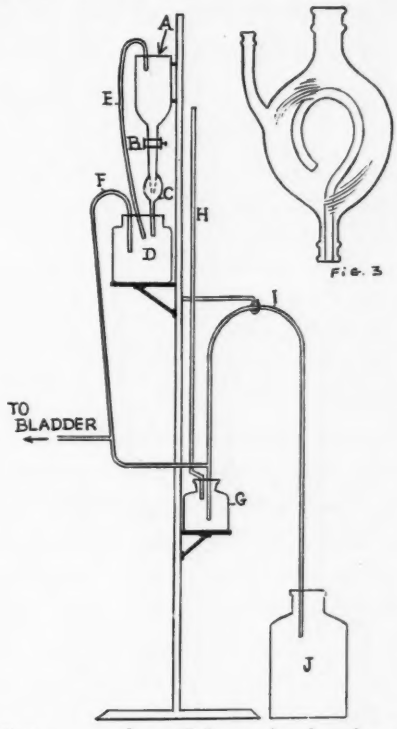


Fig. 1. Schematic drawing of tidal drainage apparatus with lead D to and exit E from the two-way catheter in bladder.

The second modification, shown in Figure 2, consists of an apparatus to instill a measured amount of fluid into the bladder and withdraw it immediately. Practically, this apparatus is limited to those cases of acute cystitis in which instillation of a soothing medication is desired. It consists of a container, *A*, from which the fluid flows through an adjustable clamp, *B*, and a dropper, *C*, to a large reservoir, *D*, from which an air vent, *E*, and a siphon arm, *F*, arise. When the fluid in *E* rises above the arm, *F*, the siphon will work and the entire contents of the reservoir, *D*, will be discharged into the system. The fluid will first fill the small reservoir, *G*, then rise in the air vent, *H*, and siphon arm, *I*, and then be forced into the bladder. The siphon arm, *I*, must be adjusted to such a height that as soon as the reservoir, *D*, is empty, fluid will begin to pass over the siphon arm, *I*. The reservoir, *G*, and the bladder are emptied and the lower siphon broken as in the first apparatus. The upper siphon is broken by the air vent, *E*. The difference in size between the two reservoirs, *D* and *G*, will determine the amount injected into the bladder, as there will be approximately enough urine secreted between fillings to take care of the volume of the tubing.



Figs. 2 and 3. Schematic drawing of apparatus to instill measured quantity fluid into bladder.

Figure 3 shows how an expert glass blower can modify the upper reservoir to make the apparatus more compact and to reduce the number of corks which might leak air.

Munro stresses the use of small rectal tubes as catheters when using this type of apparatus. We have found that whistle tip catheters work just as well and, in addition, are made of better rubber and are easier to insert.

CONCLUSIONS

1. Two modifications of the tidal drainage apparatus for the urinary bladder are presented; one with a general application, the other with a very limited application.

2. Tidal drainage has been found by the urologist to be a valuable adjunct to the treatment of many urologic disorders.

REFERENCE

Munro, Donald and Hahn, Joseph. Tidal drainage of the urinary bladder. *New England J. M.*, 212: 229–239, 1935.

Correction: In the article, "Fifty Years of Anesthesia," which appeared in our January issue, it was stated on page 242 that Paul M. Wood was the editor of *Anesthesiology*. This is an error. Dr. Henry S. Ruth is the editor of that journal.

OXYURIS VERMICULARIS APPENDICITIS

THE INCIDENCE OF OXYURIS VERMICULARIS IN A SERIES OF 1,016 CASES OF APPENDICITIS

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IN a series of 1,016 operative cases of appendicitis at the Memorial Hospital of Greene County, (441 of which were the authors') from August, 1933, to May, 1940, there were eight cases of oxyuris vermicularis infestation of the appendix.

There are many synonyms for oxyuris vermicularis, namely: ascaris vermicularis, enterobius vermicularis, seat worm, thread-worm, pin-worm, also called awl-tail, maw-worm and maggot. It is a small whitish round worm which in man infests the large intestine and very often the appendix. It is reported that they have been found as high as the cecum and have even been seen in the stomach and mouth. They apparently are incapable of multiplying in situ; for development, the ova must be swallowed. Many believe that the oxyuris plays no etiological rôle and that its occurrence in the acutely inflammed appendix is merely accidental. Invasion of the oxyuris into the mucosa of the appendix has been shown to be responsible for a considerable number of cases of appendicitis (seventeen in a series of 129, by Cecil and Bulkley).[2,4] This is an unusually high figure for as shown in our series we found only eight cases in the 1,016 studied. All removed appendices in this series were histopathologically examined. The oxyuris is, however, also found in apparently normal appendices, in the submucosa as well as in the lumen. Often little or no inflammatory reaction is found about the oxyuris; but while it may be impossible to demonstrate the point at which the organisms penetrate the mucosa, they are supposed to produce characteristically shallow hemorrhagic ulcers in the mucosa. (Figs. 1 and 2.) These might be the starting point of an acute inflammatory process not unlike that described by Aschoff.[5] Dean Lewis[6] states that "Oxyuris must be mentioned in a consideration of the etiology of appendicitis in children. They are occasionally encountered in the adult." This is apparent in our series although 40 per cent of our cases were adults. It would seem that the younger the individual, the more severe the clinical as well as the micropathological findings are when the appendix is infested with oxyuris. Parasites are not nearly so common in the suppurative and gangrenous forms of appendicitis as in the nonsuppurative type. In only one case was the appendix infested with oxyuris classified as a subacute appendicitis by the pathologist. All others were classified as "chronic." (Table 1.)

All the cases in the series of 1,016 studied were operated upon primarily for appendicitis, except for two cases. One was a prophylactic appendectomy (Case #4409) performed during the course of a hysterectomy; oxyuris vermicularis was found in the appendix on histopathological examination. In the second case (#3612), this patient was operated upon for a right ruptured ectopic pregnancy by the authors on September 3, 1939. Because of her precarious condition at that time it was deemed advisable not to remove the appendix, since there was no evidence of any gross pathological findings in the appendix. She made an uneventful recovery. Six months later, on February 27, 1940, she developed typical symptoms of appendicitis. The histopathological report on the removed appendix showed infestation with enterobius vermicularis. There was no previous history of pin-worms. As already mentioned, during the previous operation

of the right salpingo-oophorectomy for the ruptured tubal pregnancy, there was no evidence of worm infestation in the appendix when examined during the course of this operation. It, therefore, may be concluded from this, that if worms were present at an earlier date, they had not previously created symptoms or signs of appendicitis; but there is definite evidence to show that appendicitis did occur and worms were found in the removed appendix, indicating that the oxyuris vermicularis infestation subsequently caused objective as well as subjective findings of appendicitis.

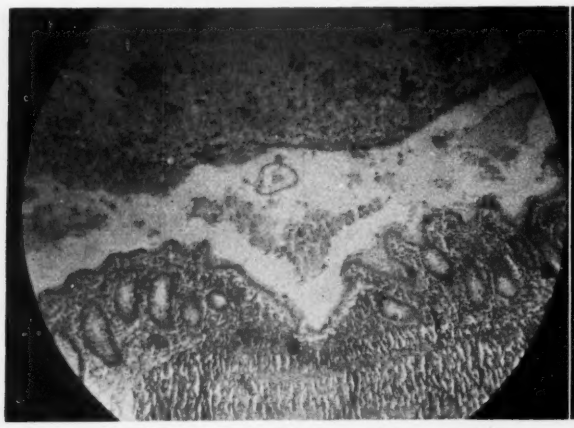

Fig. 1. Section of appendix Case No. 4598. Showing characteristically shallow hemorrhagic ulcers in mucosa. Cross section of oxyuris vermicularis in lumen of appendix. × 103.

Fig. 2. Section of appendix Case No. 4598. Showing cross section of oxyuris vermicularis in lumen under higher magnification. Note cellular infiltration in this area and inflammatory reaction with disruption of mucosal continuity. × 480.

From the cases listed the incidence is greater in children and evidently excites more violent reactions in children than in adults. (Table 1.) Oxyuris lodged in the appendix of children (and less frequently in adults) produces a typical clinical picture of appendicitis. There is pain, vomiting,

TABLE I

Case No., Initial Date of Operation	Age, Sex	Highest Preoperative Temperature	Total White Count	Per Cent of Polymorphonuclears	Per Cent of Eosinophiles	Histopathological Diagnosis, Bender Laboratory, Dr. John J. Clemmer
1. B. A. #4598... 6/11/40	5 yrs. Female	105°	21,400	86	0	Subacute appendicitis infestation with enterobius vermicularis
2. A. N. #3986... 11/29/39	10 yrs. Female	101°	15,200	50	1	Chronic appendicitis infested with enterobius vermicularis
3. W. F. #2875... 3/29/39	11 yrs. Male	99.5°	16,400	34	0	Chronic appendicitis oxyuris vermicularis in appendix
4. A. S. #3657.... 9/3/39	11 yrs. Male	101.1°	16,000	82	1	Chronic appendicitis with enterobius vermicularis
5. S. W. #1162... 12/7/37	6 yrs. Female	100.8°	17,800	76	2	Chronic appendicitis oxyuris vermicularis in appendix
6. M. B. #1191... 10/26/34	23 yrs. Female	99.2°	16,800	80	0	Chronic appendicitis oxyuris vermicularis present in the lumen
7. H. F. #4409... 4/24/40	34 yrs. Female	99.1°				Chronic appendicitis infestation of appendix with enterobius vermicularis
8. A. A. #3612... 2/29/40	26 yrs. Female	99.1°	8,700	49	0	Chronic appendicitis infestation with enterobius vermicularis

elevation of temperature, local tenderness, increased rigidity and leukocytosis. Eosinophilia is *not* a constant finding as shown by our records, and if present, is *not* very marked. The writers know of no method by which it can be differentiated unless one cares to rely entirely on the increase of the eosinophiles in the differential blood count. The most conservative plan to follow is to advise operation when typical signs present themselves, rather than depend entirely upon the eosinophilia alone, even when oxyuris vermicularis infestation is remotely suspected.

A. Battaglia and H. de Fiore[1] found that appendicitis is caused by oxyuris with a frequence of 2 per cent. Our figures in the series of 1016 cases reviewed show .007 per cent. Battaglio's and de Fiore's findings agree in that it is more frequent in children than in adults. They state that two patients out of the six of their group of eleven suffering from oxyuris appendicitis complained of symptoms of oxyuriasis—occasional dizziness with unconsciousness. In a review of our series there was no history of dizziness or unconsciousness.

The microscopic study of the removed appendix was performed in only three of the six cases in the series reported by Battaglia and de Fiore.[1] In our total of the eight cases charted, all the 1,016 appendices were microscopically examined. (Table 1.) The appendix was the site of chronic inflammation and typical oxyuris lesions. The hemogram in the three cases quoted by Battaglia and de Fiore showed an eosinophilia of 4, 5 and 8 per cent, respectively. As shown in our table, our eosinophilia findings were much lower; the highest in case #1162 was only 2 per cent. There was no mortality in the cases of oxyuris appendicitis. In only one case was there a history of inflammatory reaction with itching of the anal region prior to operation (Case #1191). The other cases gave no history of previous local anal irritation or infestation with pin-worms which is so generally accepted as characteristic.

CONCLUSIONS

1. In a series of 1,016 cases operated upon for appendicitis the incidence of oxyuris vermicularis infestation of the appendix was .007 per cent. This is considerably lower than figures quoted in previous literature.

2. Eosinophilia as a diagnostic differential point cannot be relied upon definitely.

3. Oxyuris vermicularis may be present in the appendix without creating symptoms of signs of appendicitis.

4. In the cases reviewed the exciting cause of the inflammatory reaction in the appendix was the oxyuris vermicularis, except in two cases, in which the worms were present without creating visible pathological findings.

5. In spite of eosinophilia being present, when objective and subjective signs of appendicitis are present, operation should be advised.

6. Infestation of the appendix with oxyuris in children usually creates more violent clinical as well as pathological reactions.

7. The oxyuris is rarely if ever found in suppurative and gangrenous forms of appendicitis.

8. Local symptoms such as itching and inflammatory reaction of the anus is not necessarily present and was reported in the preoperative history of only one case in the series studied.

REFERENCES

1. Battaglia, A. and de Fiore, H. *Prensa med. argent.*, 24: 1349, 1937.
2. Cecil, R. L. and Bulkley, K. A critical study of oxyuris and trichocephalus appendicitis. *Am. J. Med. Sc.*, 143: 793, 1912.
3. Orton, S. T. Oxyuris vermicularis in the vermiform appendix. *Med. Surg. Rep., Boston City Hosp.*, vol. 15, 1905.
4. Cecil, R. L. and Bulkley, K. On the lesions produced in the appendix by oxyuris vermicularis and trichocephalus Trichiura. *J. Exper. Med.*, 15: 225, 1912.
5. Aschoff. Die Wurmfortsatzentzündung. Jena, 1908.
6. Lewis, Dean. Text Book of Medicine—Cecil, R. L. P. 716. Philadelphia, 1929. W. B. Saunders Co.

PLACENTA ACCRETA*

REPORT OF THREE CASES

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PLACENTA accreta is the abnormal adherence of the afterbirth to the underlying uterine wall. It is due to a complete or partial absence of the decidua basalis, especially of its deep or spongy layer which results from the compression of the mucosal glands. The normal separation of the placenta is caused by the cleavage of this spongy layer. Absence of the decidua basalis forces the chorionic villi to attach themselves directly to the myometrium giving rise to the condition known as placenta accreta.

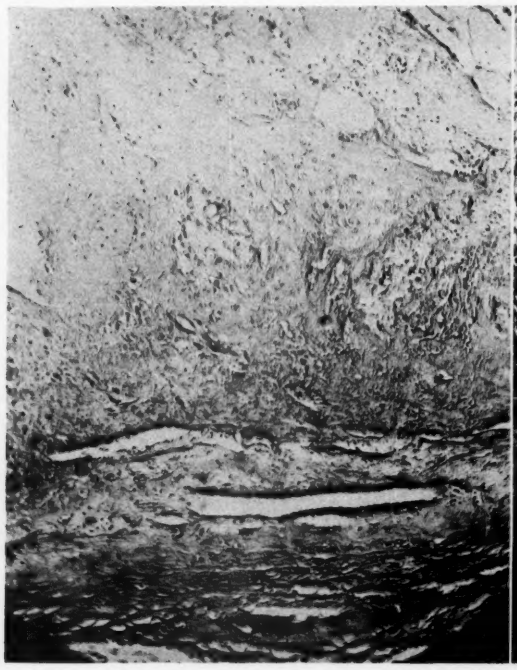

FIG. 1. Photomicrograph showing chorionic villi fused with myometrium. × 20.

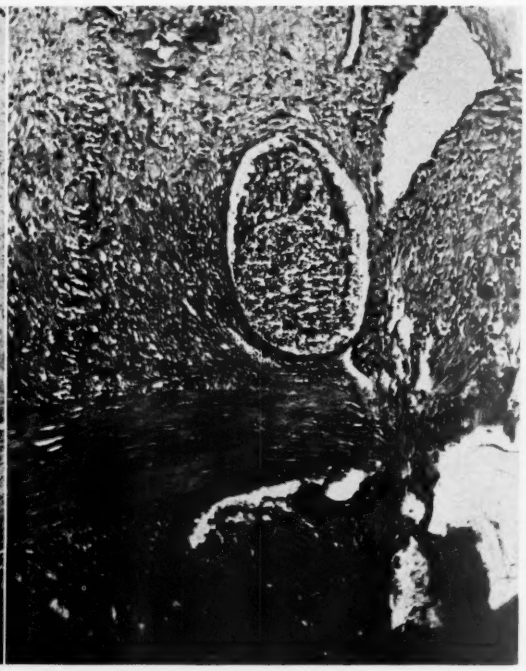

FIG. 2. Photomicrograph showing an attachment of the hyalinized trophoblastic layer directly to the myometrium. × 20.

Irving and Hertig,[1] in 1937, reviewed eighty-six cases by sixty-eight authors, a complete summary of the literature, and added an additional twenty cases of their own. The incidence in their clinic was one case in every 1,956 deliveries. We wish to add the reports of three cases from the Bronx Hospital embracing a period from July 1, 1932, through March 1, 1938. During this time there were 10,000 deliveries. Placenta accreta, therefore, occurred one in every 3,333 deliveries.

CASE REPORTS

CASE 1. H. J., No. 70574, age 24, gravida III, para 1. Her first pregnancy in 1933 resulted in a spontaneous abortion for which a curettage had been performed. The second confinement was complicated by a manual removal of a partially adherent placenta followed by a uterine infection. She had been hospitalized for fourteen days. The present delivery on October 15, 1936, was spontaneous after 4 hours of labor, although the membranes had ruptured five days before onset of pains. The

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placenta failed to separate and as there was no bleeding the patient was put to bed. Bleeding began twelve hours later and manual extraction of placenta was attempted under anesthesia by Dr. A. J. Fleischer. It was impossible to determine a cleavage line, so the uterus was packed with iodoform gauze, a 500 cc. citrate transfusion given, followed by a supravaginal hysterectomy, bilateral salpingectomy and left oöphorectomy. Convalescence was afebrile and the patient was discharged on the seventeenth day.

The specimen consisted of a postpartum uterus with an entire placenta firmly adherent to the uterine wall. Attached to the uterus were both tubes and one ovary, the seat of an 0.5 cm. corpus luteum. Microscopically (Fig. 1) the specimen showed chorionic villi fused with the myometrium. Diagnosis: Placenta accreta.

CASE II. J. R., No. 72691, age 37, gravida II, para I. The patient's first pregnancy in 1934 was complicated by a toxemia (pre-eclampsia). She had at that time a spontaneous delivery at seven and one-half months of a three pound baby which lived seventeen days. She was admitted as a private patient of Dr. A. J. Fleischer on December 17, 1936, because of a gravidity of two months and a recurrence of the toxemia. Eye and medical consultation advised interruption of pregnancy because of the presence of nephropathy. On December 28, 1936, a hysterotomy and sterilization under spinal anesthesia was done.

The specimen was a 6 by 5 cm. piece of yellowish-white tissue, apparently a portion of the uterus with an attached adherent placenta. Microscopically (Fig. 2) there was an attachment of the hyalinized trophoblastic layer directly to the myometrium. Diagnosis: Placenta accreta.

CASE III. S. G., No. 103993, age 27, gravida I, para 0. In 1932, she had what was reported as a subtotal hysterectomy for fibroids with a reconstruction of the stump of the cervix and a part of the isthmus of the uterus. She was admitted to Bronx Hospital, service of Dr. Irving Smiley, from a private sanatorium where on September 10, 1939, she had a premature breech labor of seven months' gestation necessitating extraction. In the extraction the fetal head was left in the uterus. Her membranes had been ruptured since September 7, 1939, and she now had daily chills and fever. She was put under supportive therapy, sulfanilamide and transfusions, and on September 21, 1939, the ninth day after admission, she had a supravaginal hysterectomy and bilateral oöphorectomy performed. The uterus was

FIG. 3. Photomicrograph showing direct attachment of villi and hyalinized trophoblastic layer directly to the myometrium. × 20.

found to be the seat of a rupture across the top, and a large amount of placental tissue was attached to the interior of the uterus. The patient expired four days later from sepsis and peritonitis.

The specimen was a uterus 16 by 7 cm. in size, removed supracervically. There was a large perforation at the fundus. The upper half of the uterine cavity contained adherent placental tissue. Microscopically (Fig. 3) one could see the direct attachment of villi and hyalinized trophoblastic layer directly to the myometrium. Diagnosis: Placenta accreta.

SUMMARY AND CONCLUSIONS

1. Three cases of placenta accreta are reported. One was a true clinical case. The other two were discovered in the routine examination of surgical material.

2. The incidence in our clinic was one in every 3,333 deliveries.

3. The essential pathological condition is partial or complete absence of the decidua basalis so that the placenta is attached directly to the myometrium.

I am indebted to Dr. Meyer Rosensohn for his encouragement and advice, and to Dr. Joseph Felsen for his stimulating interest in the preparation of this report.

REFERENCE

1. IRVING, F. C. *Surg., Gynec. & Obst.*, 64: 178, 1937.

Case Reports

SUBTOTAL PNEUMONECTOMY FOLLOWING GUNSHOT WOUND*

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PNEUMONECTOMY today is regarded as the treatment of choice in primary malignant bronchial tumors and extensive chronic suppurating lesions such as total unilateral bronchiectasis and multiple chronic abscesses of the lung. The first pneumonectomy in the human was performed by Kümmell in 1910 for a pulmonary malignancy. The patient lived for six days and died of postoperative pneumonia in the contralateral lung. It was not until 1933 that Graham and Singer reported the first successful pneumonectomy for cancer of the lung. Nissen reported the first successful pneumonectomy for bronchiectasis in 1931, although Lilienthal performed the first operation for this condition (unsuccessfully) in 1919. In April, 1939, Dolley and Jones reported the first pneumonectomy for extensive unilateral pulmonary tuberculosis. During this short period, not only have the indications for the operation increased, but the technique and the results have improved to a point that offers the best and permanent relief of symptoms. According to reports in the literature up to July, 1939 the operation has now been performed 241 times: 147 for malignancy; ninety-two for chronic suppuration; and two for tuberculosis.

It is the purpose of this paper not only to report another successful pneumonectomy, but also to demonstrate that the indications for the operation are further widened to include serious traumatic pulmonary injuries with uncontrollable hemorrhage. In the case cited below, a penetrating gunshot wound of the lung at the hilum, pneumonectomy was never anticipated and was necessitated by uncontrollable hemorrhage.

In resecting a lung two methods of disposal of the hilum are commonly employed, namely: mass ligation and individual dissection; and ligation of the hilar structures. The latter method is the operation of choice in treating malignant lesions of the bronchus because it removes the entire organ and regional lymph glands and enables the surgeon to excise the bronchus at a point farthest beyond the growth. The former method is now usually reserved only in cases of the chronic inflammatory group. In excising the lung after mass ligation of the hilum a varying amount of lung tissue is retained in the stump and is utilized for burying the opened ends of the bronchi. This operation, strictly speaking, should be termed a "subtotal pneumonectomy" and the term "total pneumonectomy" should be reserved for the operation of individual dissection and ligation of the hilar structures. These terms are analogous to total and subtotal hysterectomy. The operation employed in the case reported was mass ligation of the hilum with resection of the major portion of the lung.

* From Surgical Service, Newark City Hospital.

The successful outcome of this case stimulated an interest in a study of traumatic penetrating injuries of the lung.

Fig. 1. Circle under left nipple marks wound of entrance of bullet.

Fig. 2. Circle above incision marks wound of exit.

For this purpose, the files of the Essex County Medical Examiner, Dr. Harrison Martland, were studied. All cases of fatal gunshot and stab wounds of the chest from 1930 to 1939 were analyzed. A study of Table I shows that of fifty-one individuals with fatal gunshot wounds of the chest, forty-six had injuries not only to the lung, but also to neighboring vital structures which precluded any form of treatment. Of the five remaining victims, in whom only the lung was injured and a hemothorax was present, three died before they reached the hospital. Interestingly, in two of these three individuals the lung was injured near the hilum and both died in thirty minutes. Neither blood loss nor mediastinal displacement appeared to be responsible for the fatal outcome and postmortem examination disclosed the cause of death to be asphyxia, the result of blood flooding the uninjured lung. The remaining two patients survived five and seven hours respectively and might have received prompt surgical treatment.

There were seven fatal stab wounds of the chest and in each case death resulted from a laceration of the lung with total hemothorax and marked mediastinal displacement. Four of the victims were dead before any medical aid could be given, but three lived from twelve to twenty-four hours and died of injuries that were easily amenable to surgery. Therefore in fifty-eight cases of fatal penetrating wounds of the lung prompt surgical intervention could have been applied in five instances.

Table I

Wounds of chest 1930–1939

(Essex County Medical Examiner's Office)

Gunshot wounds of chest causing death	51
Wound through lung plus other vital structures	46
Wound of lung only	5
Dead on arrival (all with hemothorax)	3
Lived 5 to 7 hours (with hemothorax)	2
Stab wounds of lung causing death	7
Dead on arrival (with hemothorax only)	4
Lived 12 to 24 hours (hemothorax only)	3
Total cases for possible surgical intervention	5

As a result of this analysis it was thought expedient to study the cases of penetrating wounds of the chest that were treated at the Newark City Hospital during the same period (1930–1939). Only those cases that resulted in a hemothorax were selected

and the fatal cases of this group are included in Table I. In six gunshot wounds with hemothorax four were treated symptomatically and two required thoracotomy for drainage of subsequent infection. Twenty-three cases of penetrating stab wounds of the chest were treated conservatively without operation. Table II shows the cases treated at the Newark City Hospital.

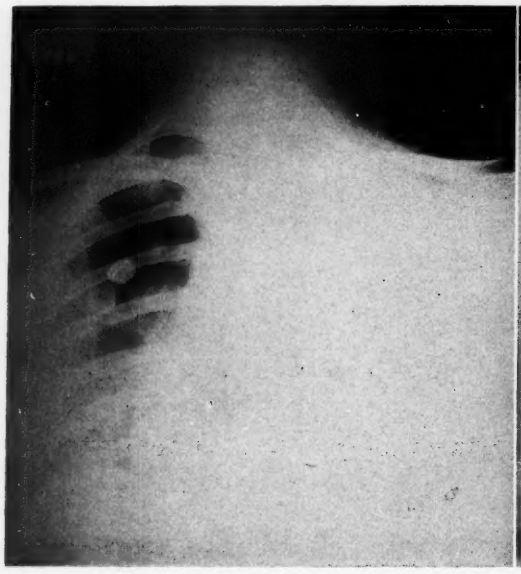

Fig. 3. Tension hemothorax with cardiac displacement.

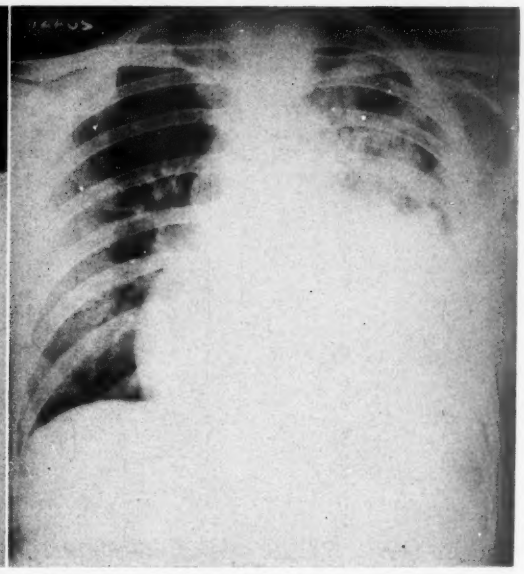

Fig. 4. Postoperative film, September 12, 1939; left pleural cavity completely packed with gauze.

Table II

SERIOUS WOUNDS OF CHEST

(Newark City Hospital 1930–1939)

Penetrating gunshot wounds of chest producing hemothorax	6
Cases treated symptomatically	4
Cases requiring subsequent thoracotomy	2
Penetrating stab wounds of chest producing hemothorax	23
Cases discharged within two weeks	15
Cases discharged after two weeks	8
Cases requiring operations	0

From the study of these two groups of cases it appears that penetrating wounds of the chest fall into two categories: first, those in which the symptoms of shock are slight or seem to be abating, and hemorrhage is controlled. These cases are treated conservatively although a hemo- or pneumothorax may be present. If mediastinal displacement produces cardiac embarrassment the increased pressure in the pleural cavity must be relieved by aspiration. To prevent renewed bleeding from the reëxpanding lung after aspiration a pneumothorax should be induced. The second group consists of the cases in which the predominant signs are those of shock and mediastinal shift because of continued hemorrhage. In this type of case, an immediate exploratory thoracotomy should be done. Simple suture of the laceration and ligation of the bleeding vessel with reinflation of the lung will be sufficient to control the majority of this type of penetrating wounds of the lung. However, although to date no case has been reported it is conceivable that a lobectomy or pneumonectomy may be necessary because the simpler procedure is insufficient or because of extensive damage to lung substance. Once an exploratory thoracotomy is decided upon, one should have in readiness a Robert-Nelson or similar type of hilar tourniquet and be prepared to resect a lobe or even the entire lung.

In no previous war has resection of the lung for gunshot wounds been reported. Due to the advances made in thoracic surgery in the past few years we may expect many casualties in the present war where resection of the lung will be feasible.

CASE REPORT

W. von D., white male, age 27, was admitted to the Newark City Hospital about midnight, August 17, 1939. He was semiconscious, perspiring profusely and in shock. His blood pressure was 100/60 mm. of Hg, his pulse of fair quality and respirations somewhat labored. He had had pneumonia at the age of 12, his father had died of pulmonary tuberculosis at the age of 48, and his first wife died of pulmonary tuberculosis at the age of 25.

Following a quarrel with his wife he became despondent and shot himself with a 38 caliber bullet through the left chest at what he thought was his heart. Examination of the chest showed the wound of entrance in the fifth intercostal space, just below the left nipple. The wound of exit was in the posterior chest, medial to the angle of the left scapula. Physical signs of fluid in the left chest were present. There was no hemoptysis or cough until the next day when he expectorated a large amount of bloody mucus.

After recovering from the initial state of shock and a severe serum reaction he appeared to be making normal progress, when suddenly on August 28, eleven days after admission, he became very dyspneic and cyanotic with a pulse of 136, respirations 48, blood pressure 90/50. Dullness was present over the entire left chest with marked displacement of the heart to the right. It was believed that bleeding in the left pleural cavity had been renewed. Aspiration of the left pleural cavity yielded 500 cc. of dark blood and his condition improved, but the next day symptoms of anoxemia and respiratory embarrassment reappeared. Five hundred fifty cc. of bloody fluid was again aspirated from the left chest and a transfusion of 600 cc. of blood was given. The condition again improved, but the next day, August 31, signs of respiratory embarrassment were once more observed. This time, in spite of the removal of 650 cc. of dark bloody fluid and a 500 cc. blood transfusion, the patient's condition remained critical. He was very dyspneic and cyanotic with the pulse 130 and respirations 60.

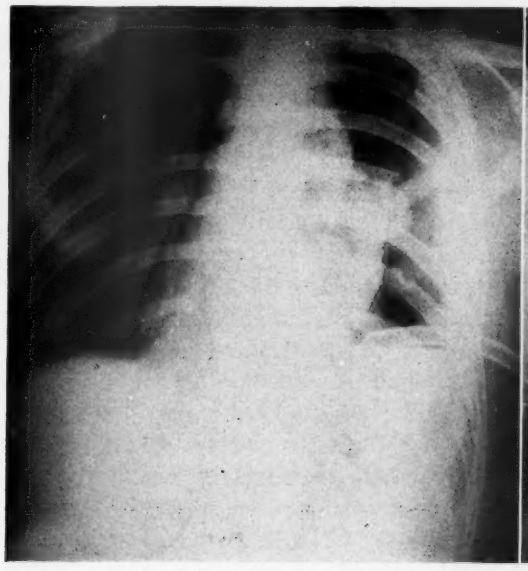

Fig. 5. Film taken September 24, 1939, shows stump of left lung and tubal drainage of empyema. Eighth rib shows bullet wound; sixth rib posteriorly resected.

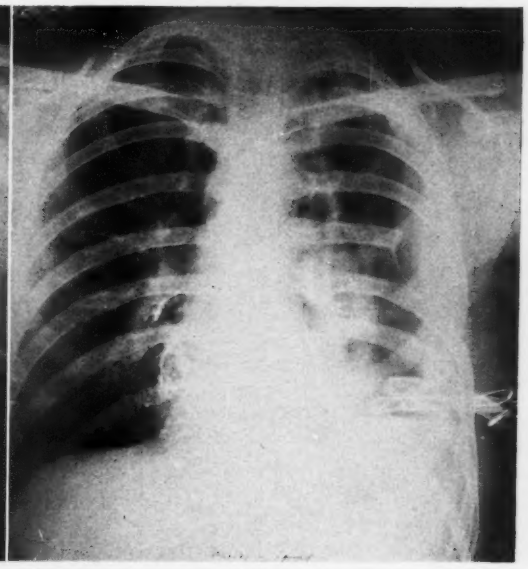

Fig. 6. Film taken October 13, 1939; beginning expansion of remnant of left lung; lipiodol in left bronchus with small fistula.

At this point, the patient was seen by the author in consultation. It was suggested that further conservative treatment be continued but that chest aspirations should be followed by replacement with air to slightly positive pressure to prevent the collapsed lacerated lung from reëxpanding and renewing the hemorrhage. Twice, 500 cc. of bloody fluid was aspirated and replaced by air. Two 500 cc. transfusions and 3000 cc. of 5 per cent glucose in saline were administered that afternoon, but the signs of respiratory embarrassment and anoxemia became so marked that death appeared imminent. At this time, it was believed that the bleeding from a large hilar vessel was reactivated and remained uncontrolled in spite of marked collapse and displacement of the left

lung. An immediate exploratory thoracotomy offered the only chance to arrest the hemorrhage.

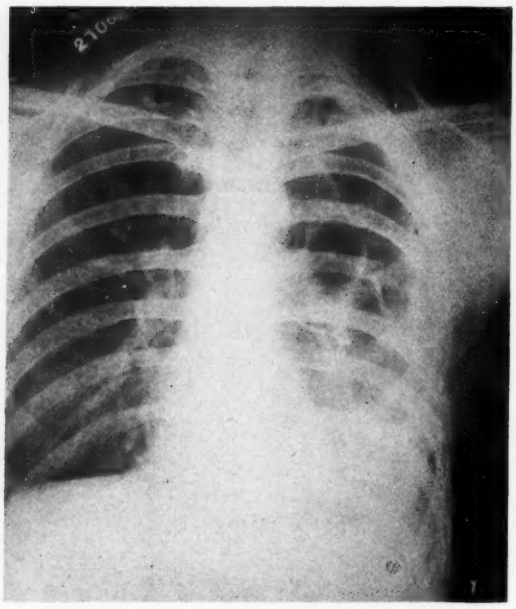

Fig. 7. Film taken December 4, 1939. Wound healed; further re-expansion of remnant of left lung; bronchial fistula freely communicating with residual pneumothorax space as shown by lipiodol.

The patient received oxygen in the sitting position and gas-oxygen anesthesia was started in this position because of the orthopnea. After a few inhalations, generalized convulsions set in, with extreme cyanosis, and the anesthesia was discontinued. The left chest was rapidly scrubbed with ether and painted with iodine. After paravertebal and local novocaine infiltration, the sixth rib was resected for about 7 inches posterolaterally and the left pleural cavity was opened. At this time, normal saline solution was administered through one of the veins of the foot.

On opening the chest, a large amount of bloody fluid and fibrin under marked pressure was released. Active severe bleeding was observed in the region of the left hilum anteriorly. The hilum was seized and compressed digitally and the mediastinum was drawn laterally. After this maneuver, the pulse could be felt feebly at the wrist. Blood was given through the intravenous apparatus. The lung was seen to be completely collapsed and the fibrin was removed from its posterior surface. The wound of exit in the left lower lobe posteriorly was clearly visible, but there was no active bleeding. When the blood clots were removed from the anterior surface of the lung no wound was found. The digital pressure was released and profuse bleeding again appeared at the anterior hilar area. Digital pressure was renewed and a Roberts-Nelson tourniquet was applied around the left lower lobe because that lobe was severely damaged. When digital pressure was again released, hemorrhage reappeared. The tourniquet was removed and reapplied about the entire hilum and this procedure controlled the bleeding. Careful inspection failed to reveal the wound of entrance or the bleeding area of the lung. At this time, the temptation to leave the tourniquet in situ and retreat was very strong. However, it was thought that it would be better to remove the lung and close the chest rather than leave an open pneumothorax and let the lung slough out. A large stump of lung tissue was left at the hilum which was sutured with several chronic transfixion ligatures. Blood vessels were individually clamped and ligated. The entire pleural cavity was packed with five large pieces of gauze, after the method described by Jose Arce. The wound was closed except for the space allowed for the gauze to protrude. Treatment for shock was instituted. Specimens of resected portions of upper and lower lobes showed atelectasis with considerable hemorrhage in the lower lobe.

The next day, September 1, the patient's condition was good, his pulse 110, blood pressure 124/72, respirations 36, and temperature 101.5°F. Dressings were changed daily because of profuse bloody serous discharge. After two weeks, large pieces of gauze were removed daily for five days; the pleural cavity was then empty and rubber tube drainage was substituted. On September 24, the pleural cavity was irrigated with azochloramid solution because the drainage had become purulent and foul. There was no sign of a bronchial fistula. *X*-ray at this time showed the thickened parietal pleura, the prominent hilar stump, and beginning extension of the residual lung into the left pleural cavity. On October 13, a small amount of lipiodol was instilled into the left main bronchus. This demonstrated the absence of lipiodol in the remnant of the left lung and a small bronchial opening with pooling of lipiodal in the left pleural cavity. On two occasions, during irrigations which caused a severe cough, a piece of foul lung slough was ejected through the wound. Following this, the discharge became thin and odorless and the bronchus

became patent. *X*-ray, at this time, showed the disappearance of a portion of the sutured stump of lung at the hilum and the beginning of expansion of the remainder of the left lung.

The patient continued to improve and gained 21 pounds from the time he got out of bed to the day of his discharge from the hospital, November 12. He has been free of untoward symptoms and his wound is entirely healed. On December 4, *x*-ray following instillation of lipiodol showed the left main bronchus open, communicating directly with the residual pneumothorax space. The remnant of the left lung had further expanded and the left diaphragm was elevated. The left chest was diminished in size and was immobile on inspiration.

At the present time he is employed driving a taxi in Newark. He feels no discomfort at any time and does not become dyspneic in the course of his work. Examination shows the left chest contracted, smaller than the right, and immobile on respiration. Breath sounds are diminished. *X*-ray examination showed no further change than that seen in the *x*-ray in Figure 7.

CONCLUSION

For the first time, subtotal resection of the lung was done for a gunshot wound near the hilum.

Resection of the lung can be a life saving procedure in cases of uncontrollable hemorrhage following injuries of the lung.

The author is indebted to Dr. Harry B. Epstein for transferring the case; to Dr. Harrison Martland and Dr. Richard Dieffenbach for their assistance and suggestions; and to Miss A. Zartler, all of the Newark City Hospital. The photographs of patient and *x*-ray films were made and furnished by Dr. Harrison Martland.

REFERENCES

1. ADAMS, W. E. Pneumonectomy for bronchiogenic carcinoma: successful case 16 months after operation. *Illinois M. J.*, 74: 442, 1938.
2. ALLISON, P. R., and STANBURY, W. S. Carcinoma of lung: two cases treated by surgical removal. *Lancet*, 2: 1165, 1938.
3. ARCE, J. Packing gauze drainage after pneumonectomy. *Surg., Gynec. & Obst.*, 65: 178, 1937.
4. CRAFOORD, C. On the technique of pneumonectomy in man. Surg. Clinic II of the Sabbatsberg Hosp., Stockholm 1938. Tryckeri Aktiebolaget Thule.
5. DOLLEY, F. S., and JONES, J. C. Surgical treatment of tumors of lung and mediastinum. *Am. Rev. Tuberc.*, 39: 479, 1939.
6. EDWARDS, A. T. Modern principles of treatment based upon 199 cases treated by lobectomy or total pneumonectomy: Harvian lecture. *Brit. M. J.*, 1: 809, 1939.
7. GRAHAM, E. A., and SINGER, J. J. Successful removal of an entire lung for carcinoma of the bronchus. *J. A. M. A.*, 101: 1371, 1933.
8. HOLST, J. Lobectomy and pneumonectomy for bronchiectasis and bronchial stenosis. *Acta chir. scandinav.*, 81: 87, 1938.
9. JONES, J. C., and DOLLEY, F. S. Lobectomy and pneumonectomy in pulmonary tuberculosis. *J. Thoracic Surg.*, 8: 351, 1939.
10. LANMAN, T. H. Surgical treatment of chronic pulmonary suppuration in children. *Am. J. Surg.*, 39: 249, 1938.
11. LILIENTHAL, H. Resection of lung for suppurative infections with a report on 31 operative cases in which resection was done or intended. *Ann. Surg.*, 75: 257, 1922.
12. MONOD, R. Remarques sur le traitement chirurgical des cancers du poumon. *Paris med.*, 1: 240, 1939.
13. MONOD, R. Remarques sur le traitement chirurgical du cancer du poumon á propos de deux cas opérés. *Mém. Acad. de chir.*, 64: 1326, 1938.
14. NISSEN, R. Extirpation bines ganzen Lungenflugels. *Zentrabl. f. Chir.*, 58: 3003, 1931.
15. OCHSNER, A., and DEBAKEY, M. Primary malignancy: treatment by total pneumonectomy. Analysis of 79 collected cases. *Surg., Gynec. & Obst.*, 68: 435, 1939.
16. OVERHOLT, R. H. Pneumonectomy for malignant and suppurative disease of lung. *J. Thoracic Surg.*, 9: 17, 1939.
17. OVERHOLT, R. H., and RUMEL, W. R. Clinical studies of primary carcinoma of lung. Analysis of 70 cases; 20 treated by pneumonectomy or lobectomy. *Journal-Lancet*, 59: 155, 1939.
18. RIENHOFF, W. F. A two-stage operation for total pneumonectomy in treatment of carcinoma of lung. Demonstrating a new technique for closure of bronchus. *J. Thoracic Surg.* 8: 254, 1939.
19. ROBERTS, J. E. H. Total pneumonectomy for single cyst. *Proc. Roy. Soc. Med.*, 31: 120, 1937.
20. SANTY, P., and BERARD, M. Total pneumonectomy: technique and report of case. *Presse méd.*, 46: 825, 1938.
21. STRODE, J. E., FENNEL, E. A., and BURGESS, A. M. Pneumonectomy: report of case. *Am. J. Surg.*, 44: 364, 1939.
22. WALKER, R. M. Total pneumonectomy. Two cases. *Proc. Roy. Soc. Med.*, 31: 1120, 1938.

FEMORAL VEIN LIGATION FOR CHRONIC OCCLUSIVE ARTERIAL DISEASE*

A STUDY OF TWENTY CASES

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IN reading the voluminous literature which has appeared in recent years on the treatment of the chronic occlusive arterial diseases of the extremities, we cannot escape several blunt observations: (1) A wide variety of methods of treatment have been offered, and the surprisingly good results with one method of treatment frequently duplicate the good results reported with other treatments. (2) The results may be as good as reported because of individual methods and, on the other hand, the surprising correlation of good results may be due to the fact that only a certain percentage of patients can be benefited under any circumstances. (3) There may be undue enthusiasm on the part of an investigator reporting good results because of pride in his particular method or failure to exercise cautious judgment. (4) Some investigators have been unable to confirm the good results of a specific method of treatment, as reported by others. (5) Improvement may be due not at all, or only remotely, to a specific method of treatment, but rather to measures of good, general care such as cessation of smoking, rest in bed, warmth, and generally improved hygiene occurring as a result of regulated observation.

Furthermore, it is important to emphasize that practically all good results reported with the various methods of treatment are based essentially on clinical observations, with little, if any, objective evidence to support the conclusion that these treatments cause a definite increase in the flow of blood to extremities deprived of blood.

It was, therefore, with considerable temerity and mental reservation that the authors of this paper began a study of the value of femoral vein ligation in the treatment of occlusive arterial disease of the extremities. This surgical procedure received fairly frequent notice, for the most part favorable, in the literature up until 1934. We are convinced as a result of our experiences that femoral vein ligation has a valuable, though limited, place in the armamentarium of therapy of the occlusive arterial diseases and is deserving of renewed interest.

SUMMARY OF REVIEW OF THE LITERATURE

In a review of the literature we find the following:

1. Considerable opinion based on clinical results is offered to support the view that femoral vein ligation is at least of some therapeutic benefit in the chronic occlusive arterial diseases of the extremities.

2. There is more uniform agreement of opinion that the procedure is probably of greater clinical value in those cases in which acute or abrupt occlusion of the artery has taken place.

3. There is definite objective experimental evidence in animals to show that femoral vein ligation has produced a richer collateral arterial tree with a markedly lowered incidence of gangrene of the extremities, following abrupt mechanical occlusion of the femoral artery.

* From the Surgical Services of Dr. J. H. Fobes and Dr. L. R. Kaufman, New York Medical College, Flower and Fifth Avenue Hospitals and Metropolitan Hospitals.

4. As yet no satisfactory objective or experimental evidence on animals has been submitted to support the clinical view that femoral vein ligation is of value in the chronic occlusive arterial diseases of the extremities.

5. The predominant theory offered to explain the therapeutic value of femoral vein ligation is that the increase in arterial and venous pressures of the extremity forces open a large number of previously inactive collateral vessels and makes available to deprived tissues an increased amount of blood nutriment.

CLINICAL STUDY OF TWENTY CASES

Our material comprises twenty cases of severe organic occlusive arterial disease of the lower extremities in which arteriosclerosis is the predominant feature. The age incidence varies from forty-two to ninety-two years; the youngest was forty-two; five cases were in the fifty to sixty year group, four in the sixty to seventy year group, seven in the seventy to eighty year group, two in the eighty to ninety year group, and one patient was ninety-two years old. A marked associated spasm is noted in two cases as evidenced by temperature release after nerve block. Diabetes mellitus is concomitant in six cases. One case, which will be discussed subsequently in detail, presents an acute arterial occlusion superimposed on a chronic endarteritis obliterans.

The cases selected for femoral vein ligations fall into two groups: The first group represents our primary indications for this procedure and consists of those cases in which gangrene was impending or was present in a minimal or early state. The second or palliative group includes those cases in which midthigh amputation was definitely indicated but in which amputation was refused by the patient or in which amputation was deemed unwise because of poor general status and a hazardous operative risk. A summary of the results with femoral vein ligation is tabulated under individual headings as follows:

Pain. In sixteen cases relief of pain within twelve hours was marked and often dramatic. In three cases there was only moderate relief, and one patient who was relieved immediately after operation developed a severe recurrence which required a neurectomy two weeks later. Some measure of lasting relief from pain was ascertained at a follow-up examination from three to twelve months postoperatively in nine cases. Of the remaining eleven patients, five required amputation from three to four weeks after femoral vein ligation, and six cases either could not be traced or are too recent to evaluate as to lasting relief from pain.

Pulse. In eighteen of our cases, palpable pulsation of the dorsalis pedis and posterior tibial arteries was absent. In two of these, the pulses became palpable following femoral vein ligation.

Course of Local Gangrene. In ten of the seventeen cases in which gangrene was present definite demarcation with spontaneous separation of localized gangrene was obtained following femoral vein ligation. There was a progressive spread of gangrene in five cases which necessitated midthigh amputation as previously mentioned. One case developed a postoperative psychosis and was transferred to another institution and the subsequent course could not be traced. Another patient developed a progressive gangrene but the poor general condition and extreme age made an amputation too hazardous a procedure and death resulted from toxemia.

CASE REPORTS

Case No. 98964, K. S., male, age 54 years. The patient was admitted with a history of frostbite and gradual onset of gangrene of the tip of left big toe. Pulses were absent. Skin temperatures before and after posterior tibial nerve block revealed no rise indicating organic occlusion of the arteries. Arteriograms corroborated these findings. Following a left femoral vein ligation, the skin temperature became elevated, pain disappeared and the gangrene demarcated early, allowing for easy removal of the slough. Follow-up eight months

later showed a maintenance of the improvement with absence of subjective symptoms.

Case No. 99494, H. T., male, age 53 years. However, following a right femoral vein ligation, the peripheral pulses were found palpable and the ulcer healed. Follow-up examination was not possible; the patient had moved to an unknown address.

Fig. 1. Arteriogram with thorotrast taken immediately before femoral vein ligation.

Fig. 2. Arteriogram immediately before femoral vein ligation.

The patient was admitted in poor condition with a generalized arteriosclerosis, diabetes mellitus, right hemiplegia and impending gangrene of the right foot. The pulses were absent; skin temperatures showed a minimal increase following nerve block and the oscillometry readings were zero. Arteriography indicated organic occlusion. Following a right femoral vein ligation, the skin temperatures increased and the pain subsided. Follow-up eight months later showed complete absence of subjective symptoms and the skin felt warm to palpation.

Case No. 94493, C. D., male, 61 years of age. The patient was admitted with a gangrenous ulceration of the right big toe, generalized arteriosclerosis and diabetes mellitus. The foot pulses were absent, oscillometry zero and nerve block failed to elevate the skin temperature.

Case No. 101352, G. C., female, 73 years old. The patient was admitted with an impending gangrene of the left foot, general arteriosclerosis and diabetes mellitus. Despite conservative therapy, the pulses were not palpable and oscillometry remained at zero. Gangrene followed. Arteriograms were taken before and one-half hour following a left femoral vein ligation. (Figs. 1, 2, 3 and 4.) Examination of the preoperative arteriogram showed a fairly good circulation evident down to about the ankle with a fair number of collaterals. No open vessels appeared below the ankle. On the postoperative plates, the anterior tibial definitely was open down to the dorsalis pedis region, an increased number of fine collateral vessels in the leg, and collaterals about the heel (not present in the preoperative plates). The arteriograms

revealed the opening up of collateral vessels as a result of the femoral vein ligation. One month later the patient was discharged with

Fig. 3. Arteriogram taken immediately after femoral vein ligation. Note increased collateral circulation.

the wound healed. Follow-up three months later showed maintenance of healing and absence of all subjective symptoms.

Case No. 99271, G. C., male, age 56 years. The admission diagnosis was general arteriosclerosis and impending gangrene of the right foot. Pain with claudication had persisted for the previous eighteen months. Petechial and embolic lesions were present in the skin of the right foot. Nerve block with skin temperatures and oscillometry indicated organic occlusion. Following a right femoral vein ligation, the skin temperature became elevated. Pain persisted but improved slowly. One month later, the patient was discharged. All subjective symptoms had cleared up. Follow-up seven months and one year later showed complete relief.

Case No. 91067, J. A., male, age 86 years. A senile male was admitted with the diagnosis of generalized arteriosclerosis and impending gangrene of the right foot. The right great toe was ulcerated and gangrenous. Conservative

Fig. 4. Arteriogram taken immediately after femoral vein ligation. Note increased collateral circulation.

treatment was followed for one month but the gangrene progressed rapidly. The patient refused an amputation. At this time, impending gangrene of the left foot was evident. Pain was extreme. A left femoral vein ligation was performed and the femoral artery was found pulseless and completely occluded. Postoperative improvement was satisfactory and the patient was discharged without subjective symptoms two months later. Follow-up in six months showed that the patient had died of natural causes and that the foot had remained in good condition.

Case No. 97755, M. H., male 68 years old. The patient was admitted with a diagnosis of impending gangrene of the third toe of the right foot complicated by diabetes mellitus. Conservative treatment was to no avail. A femoral vein ligation was performed one month later. There was a postoperative improvement in the collateral circulation. However, a superadded infection necessitated a midthigh amputation. The patient was discharged three months later.

Case No. 98892, D. C., male, age 72 years. The diagnosis on admission was generalized arteriosclerosis and beginning gangrene of toes

of right foot. Femoral vein ligation gave marked relief from pain, increased skin temperature and a return of the foot pulses. On the third postoperative day, the patient became psychotic and was transferred to a psychiatric hospital. There has been no response to our follow-up letter.

Case No. 95943, S. M., female 42 years of age. This was a diabetic patient who had developed an ulceration on the right big toe two months prior to admission. In spite of conservative treatment, the gangrene persisted and an osteomyelitis of the toe ensued. A left femoral vein ligation was performed one month later, the necrotic bone removed and the soft tissues drained. The circulation improved and the necrotic tissue gradually disappeared. On discharge from the hospital two months later, the wound was clean, granulating and nearly healed. The patient was up and about and symptom-free. Follow-up was not possible; patient had moved to an unknown address.

Case No. 7843, A. G., female 70 years of age. The patient was admitted with generalized arteriosclerosis and infected gangrene of the right great and second toes. The gangrene spread to the third and fourth toes during conservative treatment. Femoral vein ligation was followed by improved collateral circulation, cessation of pain and eventual spontaneous demarcation and healing of the stumps within five months. Follow-up one year later showed healed stumps and on absence of subjective symptoms.

Case No. 4843, T. H., male, age 77 years. The diagnosis on admission was generalized arteriosclerosis and gangrene of the fourth toe of right foot. Femoral vein ligation resulted in spontaneous amputation of the toe on the ninth postoperative day. However, infection developed at this time and within two weeks a midthigh amputation was necessitated. It was important to note that contrary to all expectations, many large collateral bleeders were present, instead of the usual almost bloodless amputation in such cases of advanced occlusion with arteriosclerosis, as noted by Spurrell. Follow-up one year later showed a satisfactory healed stump.

Case No. 3902, J. S., male, age 56 years. The patient was admitted with a diagnosis of generalized arteriosclerosis and moist gangrene of the right great toe. Arteriograms showed block of the dorsalis pedis and posterior tibial arteries. The toe was disarticulated and three days later the femoral vein was ligated. Although there was immediate relief from pain and increased skin temperature, the gangrene spread. A midthigh amputation was performed. The stump healed well.

Case No. 90012, male, 76 years of age. The patient was admitted with a diagnosis of generalized arteriosclerosis, auricular fibrillation and moist gangrene of middle toe of right foot. Pain was very severe and the patient required constant morphinization. There was immediate relief of pain and increased local warmth following femoral vein ligation. The wound was completely healed within one month. Follow-up seven months later revealed a healed toe and complete absence of subjective symptoms.

Case No. 4288, D. G., age 92 years. The diagnosis on admission was generalized arteriosclerosis and gangrene of right small toe. There was no response to conservative treatment. A femoral vein ligation gave definite relief from pain. The gangrene remained dry and clean until one month later when secondary infection set in. The patient refused an amputation and died three weeks later.

Case No. 697, M. L., female, age 75 years. The diagnosis on admission was diabetes mellitus, generalized arteriosclerosis and gangrene of the left second toe. Following a femoral vein ligation, pain disappeared, the gangrene became dry and spontaneous amputation took place one month later. At this time, uremia developed and death occurred two weeks later.

Case No. 759, N. W., male, age 63 years. The patient was admitted with a diagnosis of diabetes mellitus, generalized arteriosclerosis and gangrene of the left big toe and foot. Pain was severe. The circulation appeared very poor. The left femoral vein was ligated and it was noticed that the accompanying artery was completely occluded. Two weeks later, lymphangitis appeared. The patient refused amputation but consented two weeks later. Death ensued on the second postoperative day.

Case No. 1024, J. M., male, 56 years of age. The diagnosis on admission was generalized arteriosclerosis, left hemiplegia, pulmonary tuberculosis and moist gangrene of right big toe. Oscillometry, arteriography and histamine flares revealed an almost complete organic occlusion. Following a femoral vein ligation, relief from pain was prompt but the skin tem-

perature remained fixed. Improvement was noted for about six months. At this time, an infection occurred which subsequently necessitated a midthigh amputation.

J. W.,* male, age 75 years. The diagnosis on admission was auricular fibrillation, hemiplegia and peripheral vascular disease. The patient apparently had an acute embolic upset of the left leg about two weeks ago with increasing coldness, gangrene and mummification of the left great toe. Examination revealed the absence of palpable peripheral pulses, a well demarcated gangrenous process and no evidence of sepsis. Because of the history of acute arterial closure over two weeks old, femoral vein ligation instead of amputation was performed. This was followed by prompt relief from pain, increased skin temperatures and the gangrenous area became dry and demarcating.

E. R.,* female, age 68 years. The patient was admitted with a diagnosis of generalized arteriosclerosis and infected moist gangrene of right big toe. Suppuration and necrosis progressed. The patient refused a midthigh amputation. Following a femoral vein ligation, the pain subsided, the foot felt warmer and the gangrenous process began to localize. At present, healing is definite.

A. C.,* male, 76 years of age. The diagnosis on admission was arteriosclerotic moist gangrene of left foot and ankle. There was constant severe pain and elevated temperature. The patient refused a midthigh amputation but agreed to ligation of the femoral vein. At the time of operation, the soft tissues were debrided and drained. Following the operation, pain was markedly relieved, the wound became clean and granulations appeared. The patient was transferred to a hospital for chronic disorders two months later with the gangrenous areas clean and granulating.

SUMMARY AND CONCLUSIONS

1. Twenty cases of occlusive arterial disease of the lower extremities in which femoral vein ligation was performed, have been presented and studied with follow-up for periods ranging up to two years.

2. Definite relief of pain has been affected by this procedure in the majority of cases studied.

3. Local demarcation and spontaneous separation of gangrenous tissue has been facilitated by femoral vein ligation in at least ten out of seventeen cases of gangrene.

4. The opening up of new collateral vessels is believed to have been produced and was satisfactorily demonstrated in at least two cases.

5. Restoration of pulsation of the femoral artery was demonstrated in two cases after femoral vein ligation.

6. There was no harmful or untoward effects as a result of the venous stasis produced.

7. Femoral vein ligation is a simple procedure, easily performed under local anesthesia and unattended by any morbidity or mortality.

8. We believe this procedure to be of definite value in impending or early minimal gangrene of the lower extremities in the chronic occlusive arterial diseases.

An additional thirty cases of femoral ligation have been performed since this manuscript was submitted and corresponding good results were noted.

* Case number is designated only at time of discharge from hospital.

BIBLIOGRAPHY

1. v. Oppel. A study of the importance of veins in the collateral arterial circulation. *Ann. de clin. du Pr. v. Oppel*, 1910.
2. Makins, G. H. On Gunshot Injuries to the Blood Vessels. P. 251. Bristol, 1919. J. Wright & Sons.
3. Brooks, Barney and Martin, K. A. Simultaneous ligation of vein and artery: an experimental study. *J. A. M. A.*, 80: 1678, 1923.
4. Holman, Emile. Observations on surgery of large arteries. *Ann. Surg.*, 85: 173, 1927.
5. Pearse, H. E., Jr. A new explanation of improved results following ligation of both artery and vein. *Ann. Surg.*, 86: 850, 1927.
6. Brooke, Ralph. Periarterial sympathectomy with ligation of the femoral vein in diabetic gangrene. *Brit. J. Surg.*, p. 286, October, 1927.
7. Theis, F. V. Ligation of artery and vein. *Arch. Surg.*, 17: 244, 1928.
8. Van Gorder, C. W. High vein ligation in nine cases of thromboangiitis obliterans. *Ann. Surg.*, 90: 88, 1929.
9. Spurrell, W. S. Experimental study of circulatory changes following ligation of main vessels. *Guy's Hosp. Rep.*, 80: 20, 1930.
10. Federoff, P. A. Treatment of spontaneous gangrene by binding femoral vein. *Vestnik kbir.*, 16: 177, 1929.
11. Leriche, R. and Fontaine, R. Mechanism of action of venous ligation in arterial obliteration. *Lyon chir.*, 27: 602, 1930.
12. Pearse, H. E., Jr. Use of ligation in treatment of arteriosclerotic and diabetic gangrene. *J. A. M. A.*, 98: 866, 1932.

13. McWhorter, G. L. Ligation of both femoral artery and vein in thromboangiitis obliterans. *Surg. Clin. N. America*, 10: 283, 1930.
14. Fraser, N. D. Result of ligation in six cases of thromboangiitis obliterans. *China M. J.*, 45: 519, 1931.
15. Silbert, S. Value of femoral vein ligation in chronic arterial obstruction. *Mt. Sinai Contrib. M. Sc.*, 3: 1079, 1932.
16. Wilson, W. C. Occlusion of main artery and main vein of a limb. *Brit. J. Surg.*, p. 393, February, 1933.
17. Brooks, B. and Johnson, G. S. Simultaneous vein ligation: experimental and clinical study of therapeutic venous occlusions in arterial obstruction. *Ann. Surg.*, 100: 761, 1934.
18. Pemberton, J. deJ. and McCaughan, J. M. Traumatic lesions of arteries; indications for therapeutic ligation of veins. *Ann. Surg.*, 96: 1103, 1932.
19. Brooks, B., Johnson, G. S. and Kirtley, J. A. Simultaneous ligation: experimental study of effect of ligation of concomitant vein on incidence of gangrene following arterial obstruction. *Surg., Gynec. & Obst.*, 59: 496, 1934.
20. Achmatowicz, L. Resection of artery and vein as method of treatment of gangrene of lower extremities caused by endarteritis obliterans. *Polska gaz. lek.*, 13: 424, 1934.
21. Allen, E. V. Recent advances in the medical treatment of peripheral vascular diseases. *J. A. M. A.*, 113: 2375, 1939.

Few cases with general congestion of the venous system will fail to be detected, for they are always breathless on slight exertion, are often cyanosed, and all show clear signs in the veins of the neck when recumbent. From—"The Soldier's Heart and the Effort Syndrome"—by Thomas Lewis (Shaw and Sons Ltd.).

DIVERTICULUM OF FEMALE URINARY BLADDER
A MODIFIED OPERATIVE TECHNIC

CASE REPORT

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BLADDER diverticulum in the female is comparatively rare. This may be because many remain silent lacking the bladder neck obstructions which in the male call attention to their presence. Pugh considers 2½ per cent occur in the female; Young 10 per cent and Judd and Scholl consider diverticula of the female bladder extremely rare, reporting only two in a group of 123 cases.

FIG. 1. Bladder with large single diverticulum.

FIG. 2. Pyelouretero cystogram five months after operation.

Clinically there are two types, true and false. In the first, the wall is composed of mucosa, submucosa, and some or all of the bladder muscle layers. They are apt to be single and large, and to have a distinct, narrow neck. In the second type the wall is composed of mucosa and thinned out muscle, or connective tissue. This type is more often noticeable, usually with a larger opening into the bladder and a poorly defined neck. The first are generally considered true congenital anomalies, while the others may conceivably be due to prolonged obstruction in an old or weakened bladder. It is this type which is commonly seen in elderly men suffering from prostatic obstruction.

The following case is an interesting example of the true type occurring in a female. There was no evidence of any obstruction at the bladder outlet. As will be seen from the microscopic report of the tissue removed, this diverticulum was composed of all the true bladder layers. It remained quiescent until the patient's forty-sixth year, dormant through four full term pregnancies and one laparotomy, awaiting that degree of infection necessary to cause the one attack of cystitis which led to its discovery.

A widow of 46 was admitted to the Bristol Hospital May 12, 1926, with complaints of frequency, dysuria and pain in the left lumbar region. For three weeks before admission, she had had a constant left, dull, lumbar backache. This pain had never occurred before; it did not radiate, was worse when she was tired, but was never unbearable. Since the onset of this pain she had had frequency of urination and pain at the end, quite severe and accompanied by tenesmus. Before admission to the hospital her attending physician had given her a course of argyrol bladder instillations without any relief of symptoms. High-strung, rather neurotic, a sufferer from severe headaches, she had never been in robust health.

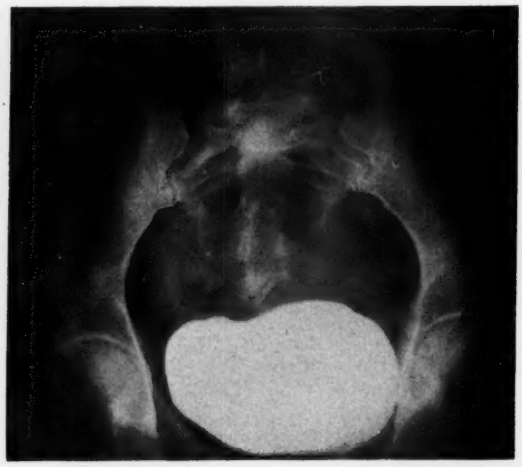

Fig. 3. Cystogram two years after operation.

Fig. 4. Pyelogram two years after operation.

At the age of 36 she had had a suspension of uterus and an appendectomy. Four full term normal pregnancies and this operation were the only points of interest in her past history. Oddly enough, these had caused no symptoms referable to the bladder.

The temperature, pulse, and respirations were normal and the blood pressure was 160/100. There was a moderate uniform enlargement of the thyroid, but the basal metabolic rate was minus 4. There was no tenderness in either lumbar region. Pelvic examination showed a firm perineum, no cystocele, a normal cervix, and a small uterus well up in anterior position. No masses were felt.

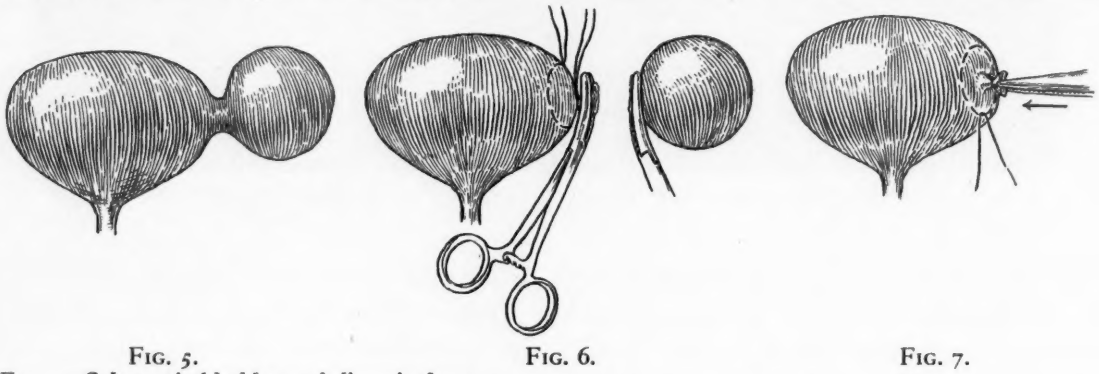

Fig. 5. Fig. 6. Fig. 7.

Fig. 5. Schematic bladder and diverticulum.
Fig. 6. Neck tied and doubly clamped; diverticulum excised; still distended purse-string suture set.
Fig. 7. Stump being inverted and purse-string suture tied.

Cystoscopic examination revealed a marked general cystitis, making it impossible properly to fill the bladder or to locate the ureteral orifices. In the left lateral wall there was an opening about the size of a lead pencil which was recognized as the mouth of a diverticulum. Phenolsulfonephthalein excretion was 30 per cent in two hours. A catheterized specimen of urine was turbid and alkaline, showed a trace

of albumin, no sugar, and a large amount of pus.

The patient was given a course of bladder irrigations with rest in bed. On May 22 a second cystoscopy was performed and the ureters easily catheterized. The diverticulum opening appeared well above the left ureteral orifice on the posterolateral bladder wall. Specimens were obtained from both sides. The right was normal and the left showed a considerable amount of pus. Intravenous P.S.P. test showed a normal appearance time on both sides.

On May 24, under gas oxygen and ether anesthesia, a cystoscope was passed and a No. 6 catheter inserted in each ureter. The cystoscope was removed and the bladder was filled with boric solution through a large rubber catheter. The catheter was left in the urethera and clamped. The bladder was exposed and by slow finger dissection well mobilized on all sides. The left ureter passed along the inferior posterior border of the diverticulum. The diverticulum could be dissected free from the ureter; its small neck entered the bladder about 3 cm. above the entrance of the ureter. (Fig. 5.) The muscular coats and the thin tissue about the neck of the diverticulum were tied with No. 1 chromic catgut close to the bladder wall. Two clamps were placed distal to this ligature, the neck cut between the clamps, and the diverticulum, still distended, removed. (Fig. 6.) The stump was cauterized with carbolic acid and alcohol. A purse-string suture of No. 1 chromic catgut was placed around the stump, most of the fluid in the bladder having been withdrawn. The stump was inverted well into the bladder, and the purse-string tied. (Figs. 7 and 8.) The site of the buried stump was covered with two rows of chromic sutures. (Figs. 9–11.) A rubber tube drain was inserted along the bladder and the wound was closed in layers about the drain. A self-retaining catheter was left in place.

Sections of the specimen showed chronic infection of the bladder wall. The columnar epithelial lining was normal but beneath it there was a generalized infiltration of small round and plasma cells. Muscular and outer connective tissue layers were normal. All the normal bladder wall structures were found in this specimen; the diverticulum could therefore only have been a congenital anomaly.

Fig. 8. Cross section showing stump inverted and purse-string suture tied.

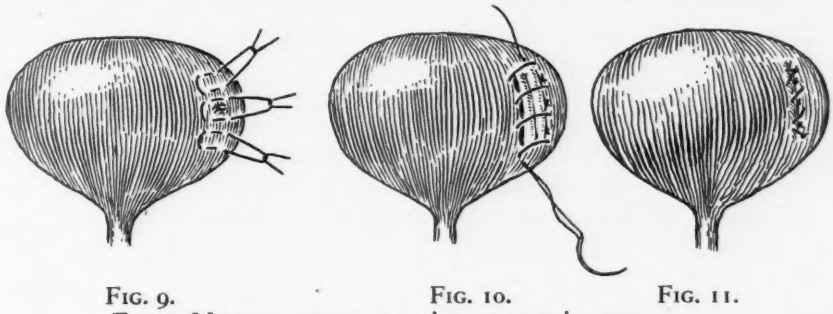

Fig. 9. Fig. 10. Fig. 11.

Fig. 9. Mattress sutures covering purse-string suture.
Fig. 10. Continuous sutures reinforcing mattress sutures.
Fig. 11. Final appearance of suture line.

After a rather stormy first week during which there was considerable bloody serous drainage from the abdominal wound, the patient's pulse and temperature became normal, and the sutures and drains were removed. At no time was the wound drainage uriniferous. On the fifteenth postoperative day the self-retaining catheter was removed and the patient was allowed out of bed. Five days later she had a sharp left pyelitis lasting four days. She was discharged on the thirty-fourth postoperative day, free from symptoms and voiding normally.

Cystoscopy on November 11, showed no cystitis. The site of the diverticulum opening was marked by a well-healed stellate scar. A No. 7 catheter was passed easily into the left side. Both ureteral specimens were normal. The patient was entirely cured of her bladder symptoms and had remarkable relief from her headaches. Twelve years after operation the patient was well and had had no bladder symptoms since her operation.

SUMMARY

A case of diverticulum in the bladder in the female is reported. This diverticulum was found to be made up of all the true bladder layers and must therefore have been a congenital anomaly.

A modified technique for the removal of diverticulum is presented. The method used here and suggested by Young is applicable only to such diverticula as are of good size, with thick wall and a distinct narrow neck, where there is no other reason for opening the bladder. Under such conditions it is technically less difficult, traumatizes the bladder less and should give a shorter convalescence than the more frequently described extra- or intravesical methods of excision.

REFERENCES

1. Young, H. H. Practice of Urology, Vol. II. 1926.
2. Pugh, W. S. *Surg., Gynec. & Obst.*, 45: 629, 1927.
3. Judd and Scholl. *Surg., Gynec. & Obst.*, 38: 14, 1924.

MALIGNANT MELANOMA

REPORT OF A CASE RECURRING AFTER FOURTEEN YEARS

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MALIGNANT melanoma, with or without operation, is surpassed by no other tumor in its tendency toward rapid local growth or widespread dissemination. However, instances in which there are long delays before recurrences are not rare. Repeated cauterization of areas has been done over a period of several years[1] before generalized metastases occurred. Many years have passed after thorough excision only to be followed by local reappearance or extensive, rapidly progressive, generalized metastases.

William H. Wilder,[15] before 1900, emphasized the importance of giving a guarded prognosis, even after many years, as he had noted melanotic sarcoma in the liver thirty-two years after enucleation of the eye for melanosarcoma of the choroid. Albers reported local recurrence twenty-four years after excision of the primary tumor and Farrell[2] recorded an instance in which generalized metastases appeared eighteen years after removal of the original lesion. Lawbaugh[16] had a patient with involvement of the liver seventeen years after removal of melanosarcoma of the eye. Farrell had another case with local recurrence fifteen years after excision. Fisher and Box[3] found a large melanoma of the liver 14 years after enucleation of an eye for primary intra-ocular melanoma.

Lukens[4] and Newton[5] each had one case with local return of orbital tumor after thirteen years, whereas Wilbur and Harlman[1] observed delayed generalized metastases after thirteen years affecting the abdominal organs, skin and pleura, without demonstrable disease in the accepted primary focus, namely, the eye.

The present case is recounted to call attention to another instance with appearance of metastases after many years during which the patient's health was excellent, and to call attention to the blood picture and the existence of an unidentified urinary pigment.

The patient, a 64 year old white man, who had done clerical work for many years, first consulted one of us (W. N.) in September, 1924, because of a mole in the skin of the epigastrium. This had been present all his life, had not increased in size or given any trouble until four weeks previously when there was onset of itching and deepening of coloration. He had applied iodine, alcohol and ether without any effect. The accompanying photograph shows location of the tumor. The more central portion was quite dark in color, the edge lighter as indicated. The darker portion showed evidence of irritation and a tendency to bleed. The skin attachment was freely movable, no adjoining skin nodules were present and no regional glandular enlargement was observed. Under local anesthesia the mole was removed with a wide margin and a skin graft applied. Pathologic examination proved the tumor to be a malignant melanoma. (Figs. 1 and 2.)

Recovery was excellent and health splendid until June, 1938, when the patient seemed to lose vigor, became weak, tired easily and experienced diminished appetite. He received symptomatic treatment until consulting one of us (W. G. H.) on November 21, 1938. Six weeks before this there was onset of dull, constant, retroxiphoid discomfort and difficulty in swallowing solid food. For two weeks, only soft or liquid food could be taken and this was frequently vomited either before the meal was finished or within one-half hour after it. There had been slight constipation. No blood was present in vomitus or stools. A persistent cough productive of a small amount of thick, gray sputum had been annoying. Some deep soreness over the mid portions of both sides of the anterior chest had been present. Loss of strength had been progressive and weight had

decreased from 165 pounds in June, 1938, to 127 pounds on November 21, 1938.

Physical examination showed a thin, pale, not acutely, but apparently seriously ill man. There was an 8 cm. curving scar high in the epigastrium, about which there were no nodules or discoloration. The lungs were clear and there was no glandular enlargement. In the left posterior axilla there was a soft, freely movable lobulated mass with a fairly sharp edge which the patient stated had been present for at least twenty years, and this appeared to be a lipoma. The sharp, non-tender edge of the liver was palpable 3 cm. below the costal margin in the right mid-clavicular line. It descended well on inspiration.

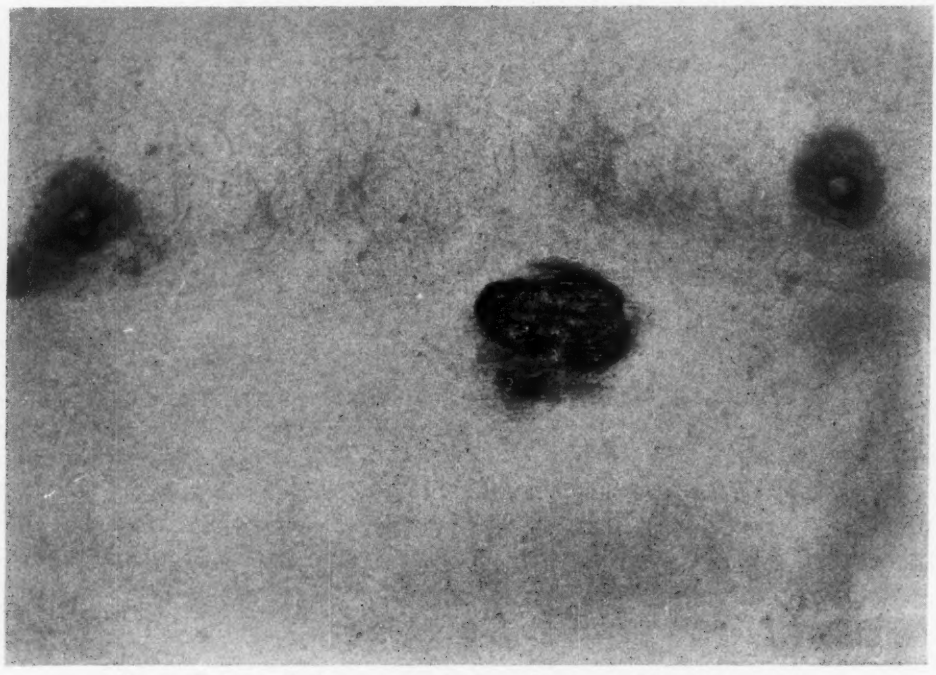

Fig. 1. Primary lesion on epigastrium showing evidence of trauma.

X-ray examinations of the chest, spine, pelvis, long bones, gall-bladder and gastro-intestinal tract showed no abnormality. The urine was clear with respect to routine examination (including inspection for Bence-Jones protein), but the test for urobilin was strongly positive and there was present in nearly all specimens a deep red coloration. The hemoglobin was 86 per cent; red blood cells, 3,940,000; white blood cells, 4,350; with segmented neutrophils, 38 per cent; staff forms, 25 per cent; myeloblasts, 1 per cent; premyelocytes, 1 per cent; myelocytes, 3 per cent; lymphocytes, 16 per cent; monocytes, 16 per cent. One nucleated red blood cell was noted. The Wassermann was negative. Gastric analysis showed no free hydrochloric acid after histamine and stools contained no blood. The icteric index was eight and the Van den Bergh negative. Upon inspection two weeks later the liver had symmetrically enlarged so that the lower border reached the level of the umbilicus in the right mid-clavicular line and gave rise to abdominal fullness. Its surface was smooth. At this time three firm fixed nodules, averaging 1 cm. in diameter, were palpated in the left axilla. These were twice as large two weeks later when consent was obtained for removal of one for study. (Biopsy by Grant E. Ward.)

Study of the tissue removed showed the following characteristics: Specimen was approximately $3\frac{1}{2} \times 5$ or 6 cm. and had a reddish-purple color. It was firm and the growth had not pierced the capsule of the gland. On cross-section the normal architecture of the lymph gland had been destroyed entirely. The cut surface was firm and grated in places, which were whitish in color, but for the most part it was dirty-gray with many small, black spots.

The normal architecture of the node was entirely destroyed and all lymphoid tissue had been replaced by tumor cells. These cells were anaplastic, varying greatly in size and shape; the nuclei stained quite darkly and the cytoplasm was granular with indefinite cell outline. Mitotic figures were seen. There was consider-

able brown pigment scattered throughout the sections; many cells were loaded with this material. The diagnosis was *malignant melanoma, metastatic.* (Histologic report by Hugh R. Spencer, Professor of Pathology, Medical School, University of Maryland.)

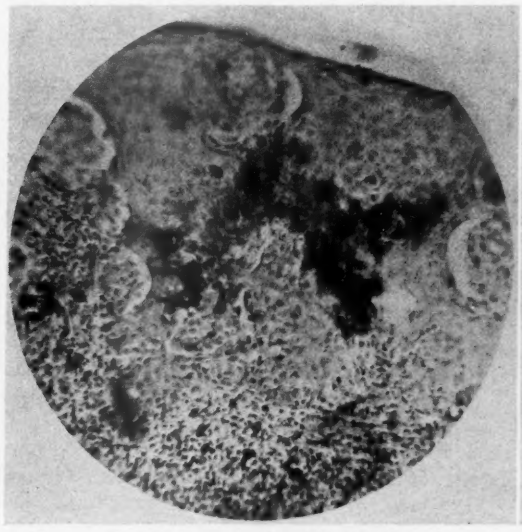

FIG. 2. Epithelium and subepithelial tissues contain melanin. There is increased vascularity in the derma. There is alveolar grouping of polyhedral cells that seem to have pushed their way downward beneath the basal epithelium. These cells show hyperchromatic nuclei and occasional mitotic figures. Diagnosis: Melanoma with malignant changes.

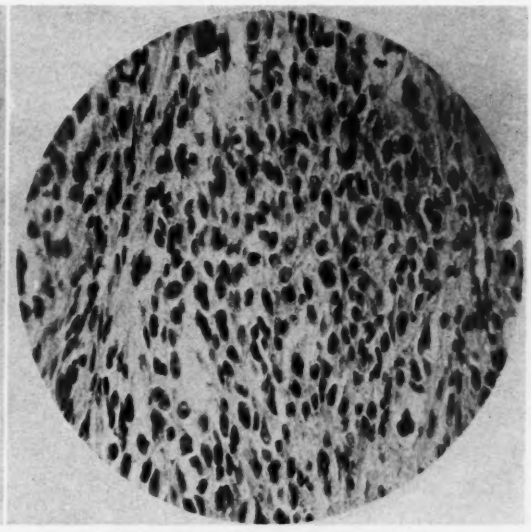

FIG. 3. Tissue is entirely composed of tumor cells. The cells are both the large polyhedral and small round cells of highly anaplastic type. They contain a small amount of melanin and are similar in appearance to those in the smaller areas in Figure 2. Mitotic figures are seen. Diagnosis: Metastatic melanoma.

The remainder of the patient's course was interesting only in that the liver continued to enlarge; multiple, firm, dull, bluish-purple nodules, up to 1.5 cm. in diameter, appeared generalized in the skin and the dull red urine changed to a thick brown. This latter color was believed caused by the presence of melanin pigment.

The course was progressively downhill and death occurred four months after the onset of symptoms of his final illness, fourteen years and three months after excision of a malignant melanoma from the epigastrium with intervening freedom from related signs and symptoms.

The finding of a large number of immature leucocytes caused some difficulty in diagnosis at first and suggested the possibility of an aleucemic leucemia. It is believed that the presence of these young forms, in this instance, indicates invasion of the bone marrow by the neoplasm.

We are acquainted with two other instances in which a dull red coloration of the urine was noted. One of these patients had a primary carcinoma of the liver, the other metastatic carcinoma to the same organ, the primary neoplasm being of the stomach. In both cases, the liver involvement was extensive. These facts caused some speculation as to the nature of the substance coloring the urine. The pigment was stable to light, but not to alkali, and gave a positive Van den Bergh reaction even in the absence of an elevated icteric index or a positive blood Van den Bergh.

In the absence of evidence of increased blood destruction, the presence of the strongly positive urobilin reaction of the urine points to liver dysfunction. This, coupled with the extensive involvement of the liver by tumor in our case and in the two cited, causes us to wonder whether we are dealing with some unidentified pigment related to bilirubin and giving the positive Van den Bergh reaction in the urine without an increased blood bilirubin.

In the absence of local recurrence many years after removal of a malignant mela-

noma, the appearance of extensive generalized malignant melanomatosis gives rise to speculation as to whether the generalized disease has arisen from another undiscovered primary lesion, or whether previous metastatic tumor cells have remained dormant, due to some unusual resistance of the host. It has been suggested that this delayed recurrence may be the result of temporary lowering of this resistance or an increase in the virulence of tumor cells, or possibly a combination of both.

It is worthy of note here that Wigby and Metz[6] observed regression of extensive subcutaneous and visceral metastases of malignant melanoma following vigorous Roentgen irradiation of the pituitary gland. They offer as a possible explanation the suggestion that one or more of the secretory substances of the pituitary "necessary for the growth or reproduction of the melanoblast" are diminished or completely removed by this treatment.

On this basis, it would not seem unreasonable to suggest that in the present instance there may have been metabolic alterations giving rise to an increased amount of this pituitary secretion in the circulation and hence reactivation of melanoblastoma cells.

SUMMARY

The metastases of malignant melanoma may occasionally remain dormant for many years and then become active and extensive. A case of this type has been presented here and reference made to numerous similar reports in the literature of the past fifty years. Interesting features of the case cited consist of changes in the blood picture constituting a "shift to the left" in the granulocytes and the discovery of an unidentified urinary pigment.

BIBLIOGRAPHY

1. Wilbur, H. L. and Harlman, H. R. Malignant melanoma with delayed metastasis. *Ann. Int. Med.*, 5: 201–211, 1931.
2. Farrell, H. J. Cutaneous melanomas. *Arch. Dermat. & Syph.*, 26: 110–124, 1932.
3. Fisher and Box. Pigmented tumor of the eyeball. *Brit. M. J.*, 1: 639–640, 1900.
4. Lukens, Charles. Recurrent melanosarcoma. *Am. J. Ophth.*, 15: 434–436, 1932.
5. Newton, F. H. Local recurrence of melanoma of the charoid thirteen years after enucleation. *Am. J. Ophth.*, 21: 668, 1938.
6. Wigby, P. E. and Metz, M. H. Striking regression of generalized subcutaneous and visceral metastases of malignant melanoma (melanoblastoma) following intensive high voltage roentgen-irradiation of the pituitary gland. *Am. J. Roentgenol.*, 43: 415–419, 1939.
7. McClure, J. Melanotic sarcoma: survival fourteen years after primary operation. *Lancet*, 2: 371–372, 1936.
8. Pleuves, F. B. Malignant melanomatosis. *Am. J. Cancer*, 26: 732–737, 1936.
9. Newton, F. H. Local recurrence of melanoma of the charoid thirteen years after enucleation. *Am. J. Ophth.*, 21: 668, 1938.
10. Nathanson, I. T. and Welch, G. E. Life expectancy and incidence of malignant disease; malignant melanoma. *Am. J. Cancer*, 31: 598–608, 1937.
11. McClure, H. M. Melanotic sarcoma. *Med. Bull. Vet. Admin.*, 15: 201–202, 1938.
12. Schroeder, Max J. Late metastasis of melanosarcoma of the liver. *Med. J. & Rec.*, 119: 601–603, 1924.
13. Koch, R. Primäres Lebermelanom. *Arch. f. Path. Anat.*, 277: 489–497, 1930.
14. Lee, F. C. Melanoma. *Surg. Clin. N. America*, 16: 1439–1448, 1936.
15. Wilder, W. H. *J. A. M. A.*, 35: 1363, 1900.
16. Lawbaugh, E. A. *J. A. M. A.*, 35: 1363, 1900.

A CASE OF RETRACTILE MESENTERITIS ASSOCIATED WITH EARLY CARCINOMA OF THE GALLBLADDER*

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A CLINICAL entity which has appeared sporadically in medical literature since 1853, but which has received only recent attention in this country, is retractile mesenteritis. Originally described by Virchow, this disease found its way into many of the earlier surgical textbooks. Virchow believed that a circumscribed peritonitis with cellulitis and sclerosing degeneration in the mesentery caused the retraction he noted, and stated that this retraction was necessary to produce volvulus of the pelvic colon. Since Virchow's first report, authors have reported one or more cases of retractile mesenteritis in the literature. Trauma or tuberculosis were considered the etiological agents, but many other theories existed. At first described as occurring chiefly in the mesenteries of the colon, it was recognized, among others, by Jura in 1927, as occurring also in the mesentery of the small intestine, and it was Jura who evidently performed the first experimental work on this disease. He injected bacteria from the intestinal flora into the mesentery of the ileum, producing a lymphangitis and subsequent retractile mesenteritis. Even Brehm, as quoted in Keen's system of surgery (1908), urges that mesenteric shrinking must be considered as a disease, sui generis, which needs treatment. The comparative rarity of this disease, however, allowed it to fade gradually from textbooks and from the literature, until recent experimental work brought it once more to the front as a true entity with a definitely explainable pathogenesis.

In a recent article, Reichert, Gerbode and Halford completely reviewed the past literature and in an exhaustive and careful manner experimently corroborated the findings of Milone and Picco, who in 1935 produced mesenteritis experimentally by ligation of the lymphatic trunks of the root of the mesentery in rabbits. Milone and Picco gave a complete description of the development of retractile mesenteritis following this procedure, dividing this development into three stages. These consisted of diffuse edema, fibroblastic hyperplasia and sclerosis of the newly formed connective tissue.

Ligation of the artery alone did not produce mesenteritis, and Reichert, Gerbode and Halford were unable to produce it by ligation of either vein or artery or both. In the latter's experimental work, it was found that irritation or trauma to leaves of the mesentery did produce mild degrees of the condition.

In the present case it is our theory that metastatic carcinoma from the gallbladder to nodes at the root of the mesentery produced the disease by massive blocking of the lymphatics of the mesentery of the small intestine.

CASE REPORT

Mrs. E. P., age 52, referred to my service at the Peninsula General Hospital by Dr. G. Metzler, was admitted March 23, 1939. She gave a vague past medical history of an operation in 1914 in which "water was found in the body." This operation was performed in a small obscure hospital which kept no records. She had had four normal children and had otherwise been in good health until four months previous to admission when her present complaints began.

* Read before the Philadelphia Academy of Surgery.

These complaints were at first very vague, consisting of aches and pains in her back and along her left side, chiefly in the upper portion of the abdomen. This was gradually followed by indigestion, belching, feeling of gas in the abdomen, with increasing constipation and increasing pain in the back along the spine but below the shoulder blades. Some six weeks before admission she went to a Philadelphia hospital for study and treatment, remaining there about three weeks. At the end of this time she was told that she had an arthritis of the spine and an upper abdominal tumor for which operation was advised. This she refused and returned home on her own responsibility.

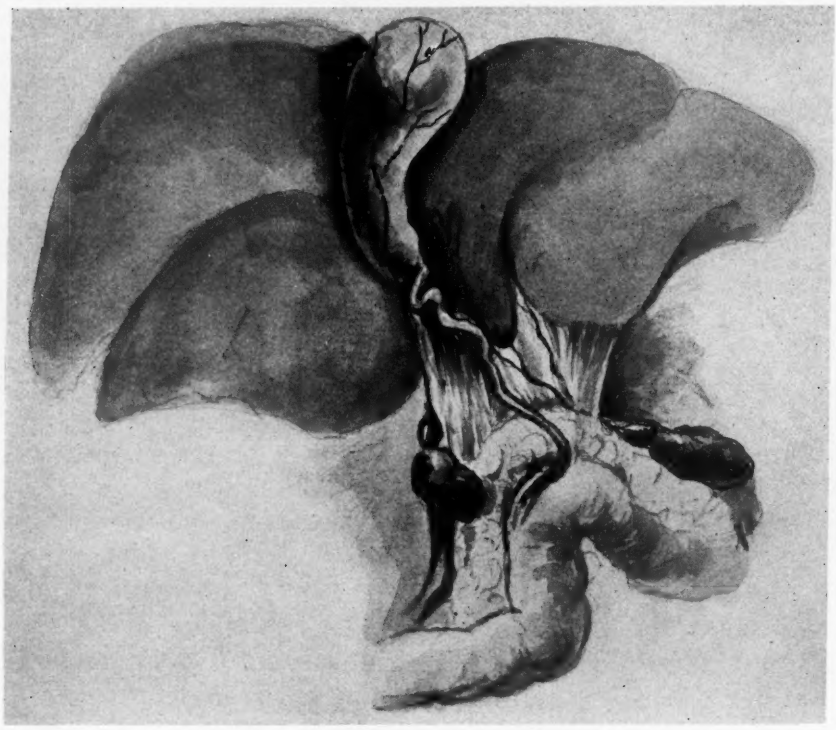

Fig. 1. The lymphatics of the gallbladder, showing the nodules at the root of the mesentery at the right, metastasis to which may produce retractile mesenteritis. (From the laboratory of research surgery, University of Pennsylvania.)

One week before admission she began to have vomiting and nausea, which appeared suddenly and, while copious at first, soon improved to a certain extent. The vomitus was chiefly bile. The remainder of her history was negative.

On admission the patient appeared as a highly querulous, moderately obese, white female who was seriously ill. Her T.P.R. was 98.2°F. — 90 — 22; her blood pressure 160/90. There was no jaundice, but the patient was extremely pale. The physical examination was otherwise negative except for the abdomen and pelvis. The former showed the scar of a previous lower midline incision. There was marked tenderness in the left lower quadrant and in the right upper quadrant. There was no rigidity. A vague suggestion of a deep mass could be palpated in the epigastrium. This seemed to be a fixed soft mass with vague outlines.

Vaginal examination revealed bilateral cystic ovaries, the right the size of a lemon, the left that of a large orange. The uterus was about three times its normal size and contained an intramural fibroid.

Since the *x*-ray report of an upper abdominal mass pushing the duodenum to the right was available, no further *x*-rays were made. A gastric analysis showed no free hydrochloric acid in any specimen and a total acid no higher than twenty at any time. There was no blood, and microscopic examination of the gastric contents was also negative. The Kline and Wassermann tests were negative. There was considerable kidney damage as shown by albumen, casts and occasional red cells in the urine and a phenolsulfonphthalein test of 20 per cent in the first and 20 per cent in the second hourly specimens. The blood count demonstrated no anemia; Hb. 85 per cent,

R.B.C. 4,100,000 and W.B.C. 10,200 with 83 per cent polymorphonuclear cells.

After four days' treatment by daily intravenous injections of saline and glucose, operation was performed on March 26. The abdomen was first thoroughly searched for the mass which had been diagnosed. This mass consisted of a swollen root of the mesentery and adhesions of the stomach to an enlarged and greatly thickened gallbladder. Nodules or enlarged lymphnodes could be palpated deep in the mass, but seemingly above the pancreas, which was normal. In the lower abdomen the omentum was found adherent to an area of sigmoid colon. The sigmoid colon was greatly shortened and its lumen was infringed upon by the omental adhesion and retraction of its mesentery. The colon was distended above this area. Release of the omental adhesion allowed the lumen to dilate and the distention of the descending colon promptly decreased. The gallbladder was very adherent to the liver and was freed with difficulty and removed. An attempt was made to secure a node at the mesenteric root, but due to edema and swelling of the mesentery and the great depth of these nodes against the vertebral column, the attempt was given up. The nodes were enlarged and were felt to be about the size of an almond shell. The wound was closed in layers with a rubber tube in Morrison's pouch, using steel wire in the fascia.

Following operation the patient had an increase of pain in the back and a rather severe rise in T.P.R. out of proportion with the operation performed. The temperature rose to 103.4°F. on the second day with pulse rate of 140. This reaction rapidly disappeared and convalescence was normal except for the continued pain in the back and the persistence of a minor degree of fever until three days before discharge. Pathological examination of the removed gallbladder showed a carcinoma which seemed confined to its walls and was estimated as grade II malignancy.

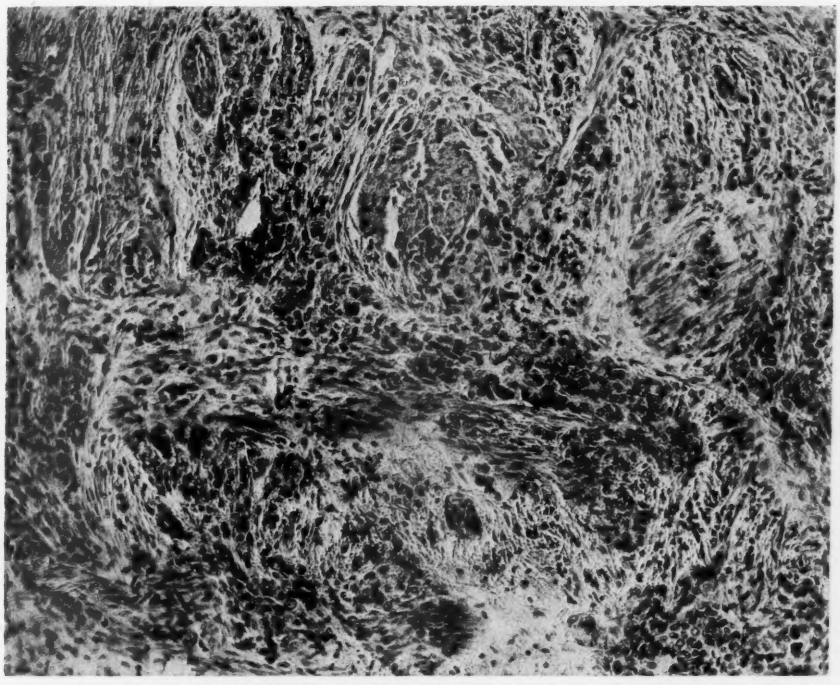

FIG. 2. Microphotograph of gallbladder carcinoma.

The patient was discharged on April 13 with no complaint but the persistent backache, which had played a prominent part through all her illness. She remained well for only a week and was readmitted on April 22, with the history of severe vomiting and failure of bowels to move for two days despite all the customary measures. Her temperature on admission was 99.4°F., pulse 96, and respiration 22. Blood pressure was 136/70. The white blood count was now 12,650 with 72 per cent polymorphonuclears. The hemoglobin had shown a marked drop to 55 per cent and the red blood cells to 3,600,000. The blood chlorides were found too low to read, and the urine showed 1+ albu-

men, but was otherwise negative. The abdomen now showed a well healed scar without infection. There was considerable distention but no rigidity or generalized tenderness. There was a huge mass in the left and middle abdomen opposite the umbilicus. Many distended loops of bowel could be palpated about this mass.

A Miller-Abbot tube was passed. The tube would not go beyond the seven-foot level. Concentrated 5 per cent saline was given intravenously and both chloride and fluid balance restored to normal and kept within normal levels from then onward. Barium was placed in the Miller-Abbot tube but this merely demonstrated an obstruction without revealing its nature. The patient objected violently to the presence of the tube, removed it several times and even when restrained in some way removed it and refused to reswallow it. After a temporary improvement by use of the tube, the patient reached a standstill despite enemas, pituitrin, phisostigmin and other medications, the bowels failing to move or the mass to decrease in size.

An exploratory incision was made May 1 after ten days' treatment in the hope that a remediable lesion could be discovered. At this time the abdomen was still somewhat distended but much less than on admission. The mass was still present in the left and middle of the abdomen.

A left rectus incision was made in the center of the abdomen. No free fluid was present in the abdomen. There was no peritonitis. The previous incision and abdominal wall were free of adhesions. The omentum now covered a huge, rounded mass, which consisted of an edematous, swollen and retracted mesentery which had pulled all the bowel into a mass and surrounded the bowel in such a manner that only short loops of a few inches were visible and then only the antimesenteric surface, since the mesentery almost completely surrounded even these loops. Mesenteric surfaces were adherent to each other and bowel loops adhered to each other, so that the entire small intestine seemed to be drawn up short to the mesenteric root and engulfed completely by the mesentery to form a mass the size of a man's head. The colon, stomach and pelvic organs were entirely free of this mass. The gallbladder bed contained a few recent adhesions, but this area and the duodenum were also free of the process. The omentum was separated from the bowel with great care, and an area of kinked intestine identified as the obstructed one by finding the end of the Miller-Abbot tube in it. This kink was freed to release the obstruction and the tube passed a short distance beyond it until the loop vanished deep into the mass. Many other loops were retracted so much that it was obvious that obstruction was imminent in these loops. It was also obvious that any attempt to remedy the condition would have involved resection of the entire mesentery and the entire small intestine, a process too formidable even to consider. The wound was closed in layers without drainage.

Despite the hopeless appearance of the lesion seen at operation the patient seemed to do rather well for four days with the aid of continuous intravenous salt and glucose solution. The temperature did not rise above 100°F. and the pulse remained from 100 to 120. Vomiting was controlled by the continued use of the Miller-Abbot tube. On the fourth postoperative day the patient developed a fecal fistula through the recent wound and soon thereafter began to show signs of collapse with a gradually dropping blood pressure. She remained conscious and rational, but despite all measures died on May 8, eight days after operation. The bowels did not move but there were no physical signs of peritonitis. Permission for a postmortem examination was refused.

This patient illustrates a case of severe, massive retractile mesenteritis, ending fatally and probably caused by blockage of the mesenteric lymphatics by carcinoma originating in the gallbladder. Both operations, moreover, illustrated in the human two of the stages observed in animals, namely, the stage of fibroblastic hyperplasia and the later stage of retraction by hardening of the fibrous tissue and retraction of the entire mesentery. It seems to the writer that these stages must fuse somewhat in the human, since edema and hyperplasia were present in the periphery of the mesentery at the last operation when the third stage was present in the deeper parts.

SUMMARY

The literature and experimental work of retractile mesenteritis are here briefly

reviewed. This is followed by a complete case report of retractile mesenteritis associated with carcinoma of the gallbladder, in which carcinoma of the mesenteric lymphatic nodes are thought to be the primary cause of the production of the disease. The patient was operated upon at two different times and two stages of the development of the disease were observed for the first time in humans as seen in animals in whom the disease was experimentally produced; namely, the stage of hyperplasia and the stage of retraction by hardening of the fibrotic tissue and thus retraction of the entire mesentery. Significant differences in this process as compared with the process in animals were pointed out.

REFERENCES

1. Reichert, F. L., Gerbode, F. and Halford, F. J. Sclerosing or retractile mesenteritis. *Ann. Surg.*, 110: 669, 1939.
2. Reichert, F. L. and Mathes, M. E. Experimental lymphedema of the intestinal tract and its relation to regional cicatrizing enteritis. *Ann. Surg.*, 104: 601, 1936.
3. Brehm, O. Über die Mesenterialschrumpfung und ihre Beziehunger zum Volvulus der Flexura Sigmoidea. *Arch. f. klin. Chir.*, 70: 267, 1903.
4. Bonorino, Udaondo C. Las mesenteritis esclerosantes y retractiles. *Presa med. Agent.*, 16: 233, 1929.
5. Jura, V. Sulla mesenterite retractile e slerosante. *Policlin., Roma*, 31: 575, 1924.
6. Stropeni, L. Ricerche sperimentali sulla patogenesi della mesenterite retractile. *Boll. e mem. Soc. Piemontesse di chir.*, 3: 668, 1933.
7. Milone, S. and Picco, A. Sulla pathogenesi della mesenterite retractile (nota preventiva). *Boll. e mem. Soc. Piemontese di chir.*, 3: 1069, 1933.
8. Milone, S. and Picco, A. Sulla pathogenisi della mesenterite fibrosa retractile. *Arch. ital. di chir.*, 39: 117, 1935.

HYPERNEPHROMA ASSOCIATED WITH HYPERPLASIA AND METASTATIC CARCINOMA OF THE ADRENALS*,†

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HYPERNEPHROMA, the most common tumor of the renal cortex, while clinically a well established entity, is subject to much controversy pathologically. Grawitz, in 1883, first pointed out that the small yellowish nodules, occasionally found in the cortex and capsule of the kidney, are not lipomata at all, but adenomata arising from adrenal rests of the kidney, closely resembling the struma suprarenalis of Virchow. Birch-Hirschfeld, in 1892, suggested the term hypernephroma for all "Grawitz tumors," and though this nomenclature has gained a firm hold in the literature, the conceptions of what constitutes hypernephroma are as much in dispute today as they were several decades ago. Authorities like Lubarsch, Kelly, Kestenko and others, strongly supported the Grawitz theory, while first Sabourin and Cornil and then Sudeck, Stoerk and Wilson were its earliest opponents. Among the newer writers, Ewing is of the opinion that "the group of adrenal tumors of the kidney differs, as a whole quite distinctly from renal adenocarcinomata with clear cells." This view was also shared by Boyd. However, in the newer edition of his textbook on Surgical Pathology, Boyd has been converted to the belief that little is to be gained from the distinction between hypernephroma and renal carcinoma and classifies all these tumors under "the well established heading of hypernephroma, with the clear understanding, however, that the use of this name does not commit one to the adrenal theory of origin of these tumors." Bell, Cabot and others consider all hypernephromas as carcinomas of the renal cortex arising from epithelial origin, while Hinman restricts the term to tumors arising from adrenal rests.

Several substitute names for hypernephroma have been suggested, but only few established themselves in current use. Lubarsch introduced the name "hypernephroid tumor." MacKenzie employs the term hypernephroid "to include all those malignant tumors that resemble the adrenal cortex both in histology and structural arrangement." Others use it more indiscriminately to designate all types of parenchymal carcinoma of the kidney, and Young favors the abandonment of the confusing nomenclature altogether in favor of a group name, nephroma, "since it resembles the term in use, and commits us to no unproved theory."

The subject is not only of theoretical, but also of clinical, significance. Even if we were to accept the majority opinion of pathologists that all renal tumors arise from tubular epithelium and that the formation of tubules and papillae observed in hypernephroma does not coincide with the histologic picture of the adrenal cortex, there is still room for distinction between adenocarcinoma (hypernephroma) and alveolar carcinoma of the kidney. The distinction is not minimized by the fact that both pathologic forms may be found in the same tumor. Foulds and Braasch have pointed out that adenocarcinomas are composed of pathologically more differentiated cells and are also clinically more benign than the less differentiated alveolar carcinomas with solid cords without lumens, composed of granular or clear cells. The latter are more malignant, exhibit a

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more rapid growth and form early metastases.

The case of adenocarcinoma of the kidney here reported makes the question of origin and differentiation even more pointed because it presents a rare combination of malignancy of the kidney with hyperplasia of the adrenal cortex, infiltrated with metastatic foci, and clinical manifestations of "virilism."

CASE REPORT

G. R., a white married woman, age 37, was admitted to the hospital on May 23, 1937, with the chief complaint of hematuria and general weakness. Except for the usual childhood diseases she had been in good health until about a year before, when she became aware of rapid loss of weight, intermittent hematuria and, for the previous five months, occasional renal colic and bladder distress, followed by passage of large blood clots. At about the same time she noticed hair growing on her face. Except for the last missing period, her menses which started at the age of 13 years, had always been regular and painless, lasting about six days. She had never been pregnant.

Physical examination revealed an extremely emaciated female, looking much older than her age, 145 cm. in height and 90 pounds in weight, with masculine features, sunken eyes and prominent cheek bones. Her cheeks and chin were covered with a beard-like growth, 1 to 2 cm. in length. (Fig. 1.) Her skin was dry and unelastic, hanging in folds. The mucous membrane was extremely pale. Her breasts were atrophied. Temperature on admission was 102°F. The heart was within normal limits, cardiac action was regular, at an increased rate, with a soft systolic murmur transmitted to the outer axillary line. The lungs appeared normal on percussion, with somewhat exaggerated vesicular breathing in the left intrascapular region. There were no râles and no pleural rub. Blood pressure was 102/60, and the pulse rate from 130 to 100. The shape of the abdomen was scaphoid. In the right upper quadrant a large nodular mass, firmly fixed, was palpated, which protruded from under the right costal arch, reaching downward for about three fingerbreadths and merging with the edge of an enlarged liver. There were no other masses in the abdomen and no costovertebral tenderness. Vaginal examination was negative.

The urine was grossly bloody, alkaline in

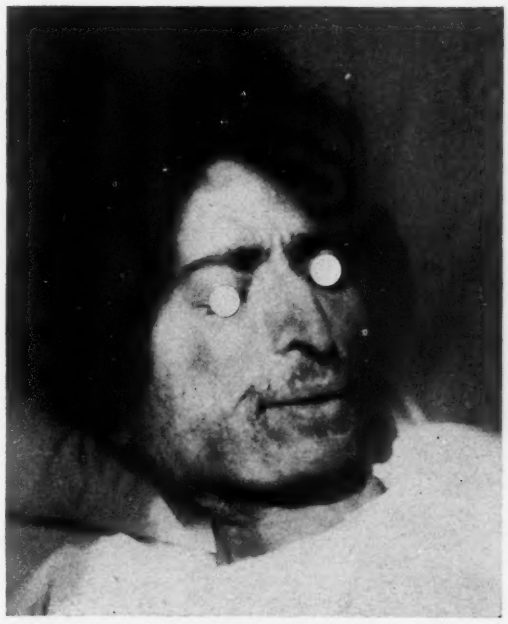

FIG. 1. Hypertrichosis.

reaction with a fixed specific gravity of 1,010. Blood examination revealed 2,000,000 red blood cells and 40 per cent hemoglobin. White blood count was 14,300, with 90 per cent polymorphnuclear neutrophiles; 10 per cent lymphocytes; 87 per cent segmented; 3 monocytes; 4 stab; 1 basophile. Blood chemistry was: glucose 88.7 mg. per cent; urea 18.2; creatinine 1.66; uric acid 3.98; nonprotein nitrogen 40.2; cholesterol 176; calcium 11.0; phosphorus 3.86; chlorides in whole blood 486.0, in plasma 594.2 and in cells 298.0; CO_2 capacity 66; icteric index 4.62. Blood urea clearance test was 34.2 per cent. Wassermann and Kahn tests were negative. Urinary output in twenty-four hours ranged between 30 and 50 ounces.

Cystoscopy under caudal anesthesia, after evacuation of a considerable number of blood clots, revealed a bladder of small capacity and deeply congested, especially in the trigonal region. An organized blood clot was removed from the right orifice with a cystoscopic forceps before inserting a No. 6 ureteral catheter. There was no obstruction in either ureter, and pure blood was aspirated from the right kidney. The left catheter drip was normal and the specimen slightly cloudy. Indigo-carmine injected intravenously gave a two plus blue return from the left kidney in fourteen minutes, and none from the right kidney in twenty minutes. Urine from

bladder and cystoscopic specimens contained staphylococci on smear and culture.

X-ray examination showed a large staghorn

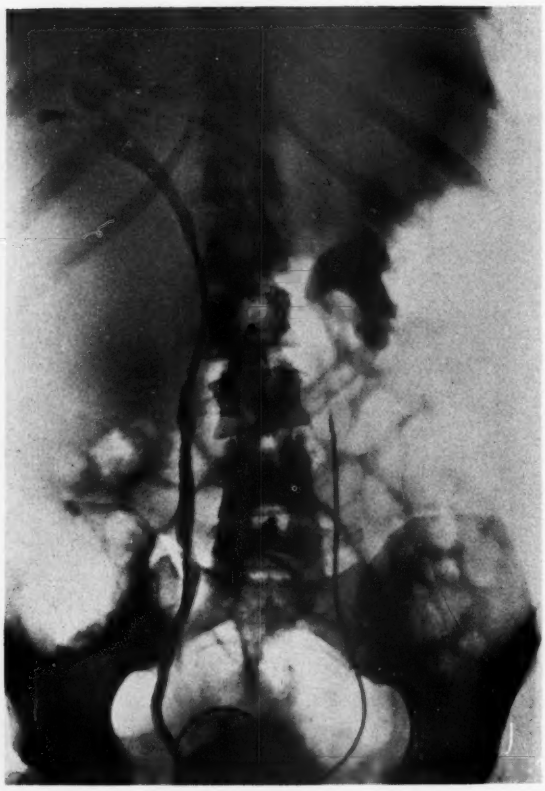

FIG. 2. Retrograde pyelogram of right kidney. Calculi in left renal pelvis.

calculus in the left kidney and a soft indefinite mass in the right side with no psoas markings. Intravenous urography revealed some dye in the sacculated upper calices of the left kidney in twenty minutes, the entire pelvis, the middle and lower calices being occupied by the calculus. No dye appeared in the right kidney one hour after intravenous injection of diodrast. On retrograde pyelography (Fig. 2) the right kidney appeared very much enlarged, the pelvis was dislocated in the direction of the upper pole with partial obliteration of the middle and complete obliteration of the lower calices. The proximal portion of the ureter was displaced mesially. The entire left pelvis was filled with the aforementioned calculus which formed an almost exact mould of the renal pelvis and calices. *X*-ray of the chest revealed an area of opacity at the midperiphery of the left lung field, with a smooth curvilinear convexity at the mesial aspect of the shadow, suggesting a metastatic lesion. No metastases were found in skull and long bones.

The above findings suggested neoplasm of the right kidney with metastases in the lungs, and staghorn calculus in the left renal pelvis. The combined lesion of both kidneys in the presence of metastases, poor renal function and poor general condition precluded any possibility of surgery and palliative treatment was resorted to. The patient received repeated blood transfusions, intravenous glucose therapy and general measures, all of which failed to affect her condition or to raise her red count figures. She grew perceptibly weaker, became drowsy and listless and in the terminal week developed a right-sided septic parotitis. She expired July 2, 1937, forty-one days after admission.

Autopsy. The abdomen was opened by a median incision from the xyphoid process to the symphysis. The panniculus adiposus measured less than 0.5 cm. in thickness. The right diaphragmatic dome was at the fourth intercostal space, the left at the fifth intercostal space. The liver edge was below the costal margin in the midclavicular line. The anterior pole of the spleen was at the left costal margin. The bowels were in a state of moderate constriction. In the anatomic place of the right kidney there was a tumor mass the size of a child's head, covered by a firm capsule and attached by numerous, easily torn fibrous adhesions to the neighboring organs, especially to the edge of the liver and to the hepatic flexure of the colon. The descending part of the duodenum was covered by the right edge of the tumor mass. The heart was essentially normal, but the lungs showed numerous well defined metastatic nodules from 5 to 50 mm. in diameter, most of which were subpleural. Metastatic invasion of the tracheobronchial lymph nodes was seen. Liver was considerably enlarged and very flabby. It measured 29 by 19 by 9 cm., and weighed 1836 gm. The cut surface had a very definite yellow tint and bulges. The gallbladder contained a large black, mulberry shaped calculus, of cholesterol variety. The spleen was considerably enlarged, measuring 15.5 by 8 by 4.5 cm., and weighed 280 gm. The follicles could be seen with difficulty. The splenic vessels showed no gross changes.

The right kidney appeared as a tumor the size of a child's head, the anatomic relations of which have already been described. It measured 19 by 8 by 10 cm., and weighed 860 gm. It was surrounded by a very firm, highly vascular capsule, which itself was riddled with

multiple, pea-sized tumor nodules. The adrenal gland was well defined and firmly attached to the posterior aspect of the kidney. The fibrous capsule could only partially be removed from the surface of the tumor. On section, the entire lower half of the kidney was occupied by a large tumor mass, which measured 15 by 9 cm. and was indistinctly delimited from the renal tissue. The tumor mass was of bright yellow color with many red areas. It was of moderately firm consistency, but showed large, soft, pinkish-yellow, mottled, depressed areas of necrosis and degeneration. Many wide blood vessels were seen within the tumor mass. The latter also invaded the renal pelvis, which was distended, but almost entirely obliterated by the tumor. The non-obliterated parts of the pelvis were filled with a large blood clot. The renal parenchyma formed the upper portion as a rather narrow layer along the convexity of the whole mass. Its surface was riddled with tumor nodules of 1 to 2 cm. in diameter, and similar nodules were found on the cut surface. There was no sharp outline between cortex and medulla. Both showed a pinkish-yellow color. The calices were markedly dilated and the tops of the renal pyramids were flattened. The blood clots in the pelvis continued into the ureter, which ran along the medial aspect of the tumor mass, imbedded in the firm, fibrous capsule of the tumor. The mucosa of the ureter was swollen and diffusely reddened. The right renal vein was entirely obliterated by the tumor masses, which extended into the vena cava. The intima of the latter, in the vicinity of the opening of the right renal vein, was covered by flat, yellow, indistinctly outlined tumor masses.

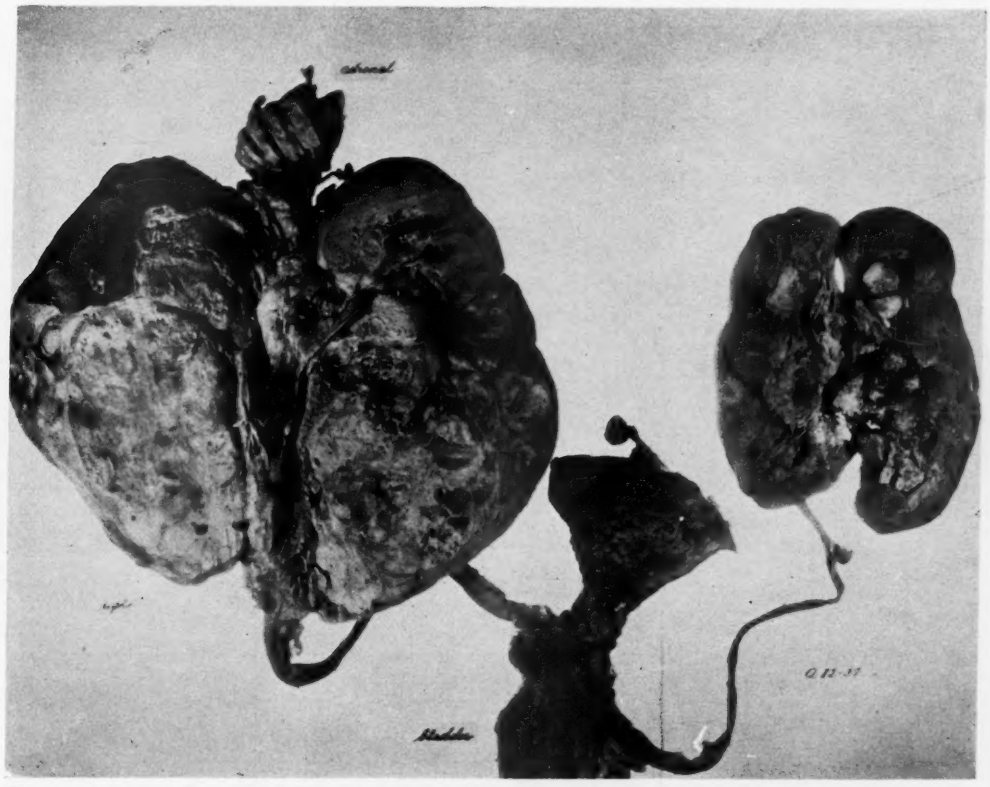

Fig. 3. Gross specimen of kidneys, ureters and bladder. Note tumor of right kidney, compressed pelvis, attached right adrenal; calculi and metastatic nodules in left kidney.

The left kidney measured 12.5 by 5 by 5 cm., and weighed 260 gm. Its capsule stripped with ease and revealed a smooth surface, which showed multiple, elevated, sharply outlined, round, yellow tumor nodules from 0.1 to 1.5 cm. in diameter, some of which had central necrosis. The surface of the renal tissue was pinkish-gray. On section, a large amount of thick, yellow, cloudy pus poured out of the renal pelvis. The latter was markedly distended and contained three calculi, the largest a perfect cast of the lower half of the renal pelvis, which it obliterated entirely. The stone measured

4.1 by 1.6 by 1 cm., was of firm consistency, had a rough, red and yellow surface and was adherent to the renal pelvis. The upper part of the pelvis was dilated, ovoid in shape and obliterated by a firm, yellow calculus the shape and size of a pigeon's egg. The third calculus was found in a dilated calyx near the lower pole of the kidney. The mucosa of the renal pelvis was somewhat thickened and rough, but showed no marked inflammatory changes. The remaining part of the renal tissue showed a partly distinct and partly indistinct outline between cortex and medulla. The renal parenchyma was flabby and of yellowish-red color. There were multiple round tumor nodules on the cut surface. The vessels of the left kidney showed no abnormalities.

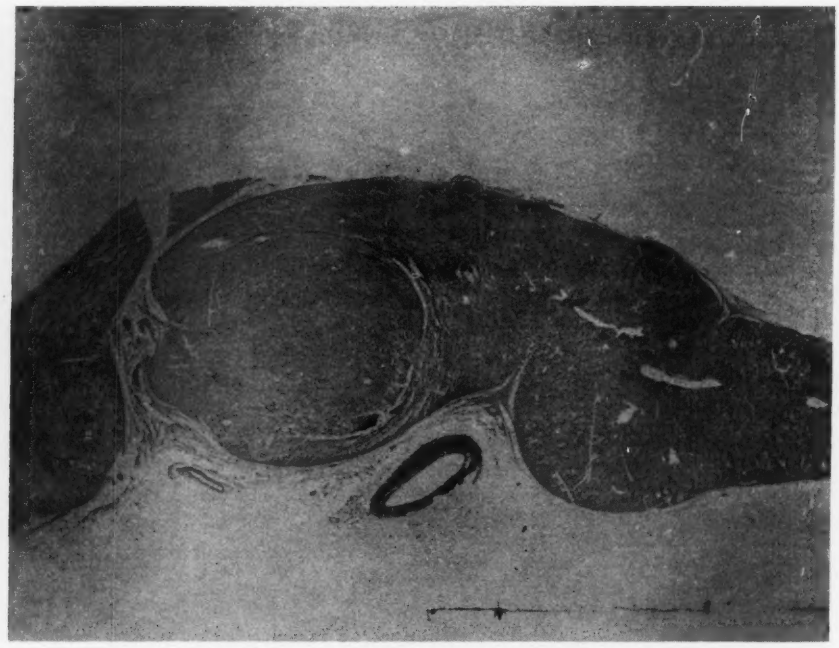

Fig. 4. Left adrenal showing a large metastatic node and hyperplasia of the cortex.

The bladder was contracted. There was diffuse reddening of the mucosa, which was especially marked at the trigone. Both ureters opened at the normal site with slit-shaped openings.

Both adrenals were large. The left (Fig. 4) weighed 24 gm. and the right about 20. The right adrenal was firmly adherent to the capsule of the right kidney tumor. On section, white distinctly outlined tumor nodules 3 to 6 mm. in diameter were found in each adrenal. The adrenal tissue itself showed a somewhat undefined pale cortex. The medulla was gray and homogeneous.

Of the gastrointestinal tract—the sigmoid showed multiple diverticula, measuring 2 to 5 mm. in diameter and of varying depths. Indurated fecal stones were found in many of these diverticula and the mucosa often showed small ulcers 3 to 7 mm. in diameter. There were also a few round ulcers independent of the diverticula. All ulcers had sharp, slightly ragged edges. Some of them extended almost through the muscularis propria while others were more shallow. Scattered over the serosal surface of the colon were a few tumor nodules 0.5 to 1 cm. in diameter and sharp in outline. Similar nodules were found in a few places in the submucosa of the sigmoid. They all had the gross characteristics of metastatic foci. The rectum showed a diffuse, reddish-brown discoloration of its mucosa. The mesenterium contained many, slightly enlarged, rather soft lymph nodes. On section they were whitish and homogeneous.

The genital tract was essentially normal.

Microscopic Findings. Sections of the right kidney (Fig. 5A and B) showed a variety of histologic pictures. For the most part, the cells were large polyhedral with small hyperchromatic nuclei and abundant granular cytoplasm. They were arranged in solid medullary masses or showed a distinct lumen in the center. Frequent papillary formation was seen throughout. There were also small areas where the cyto-

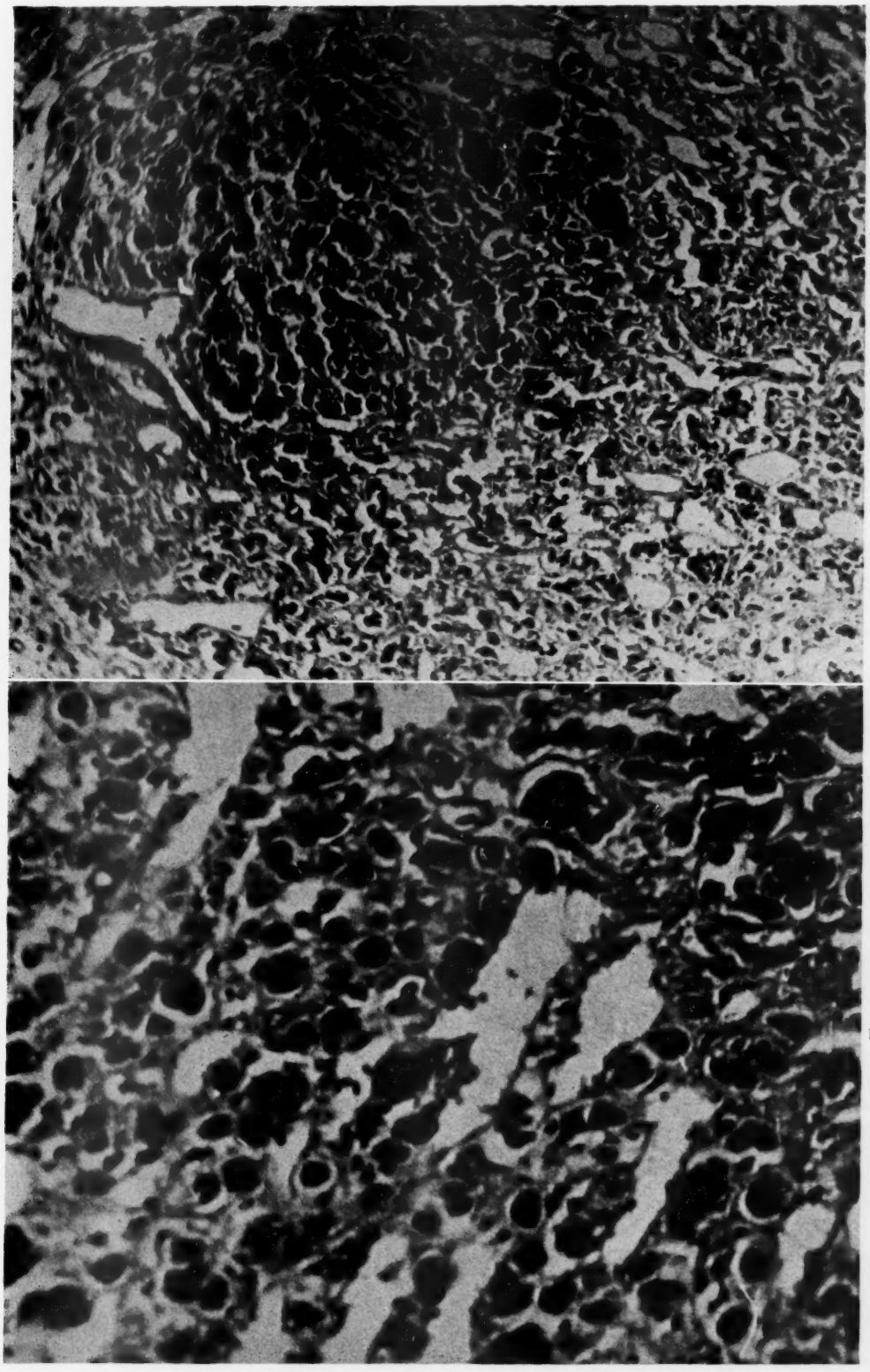

Fig. 5. A, low power photomicrograph of section from kidney tumor (clear cell and granular cell type). B, high power magnification of section from kidney tumor.

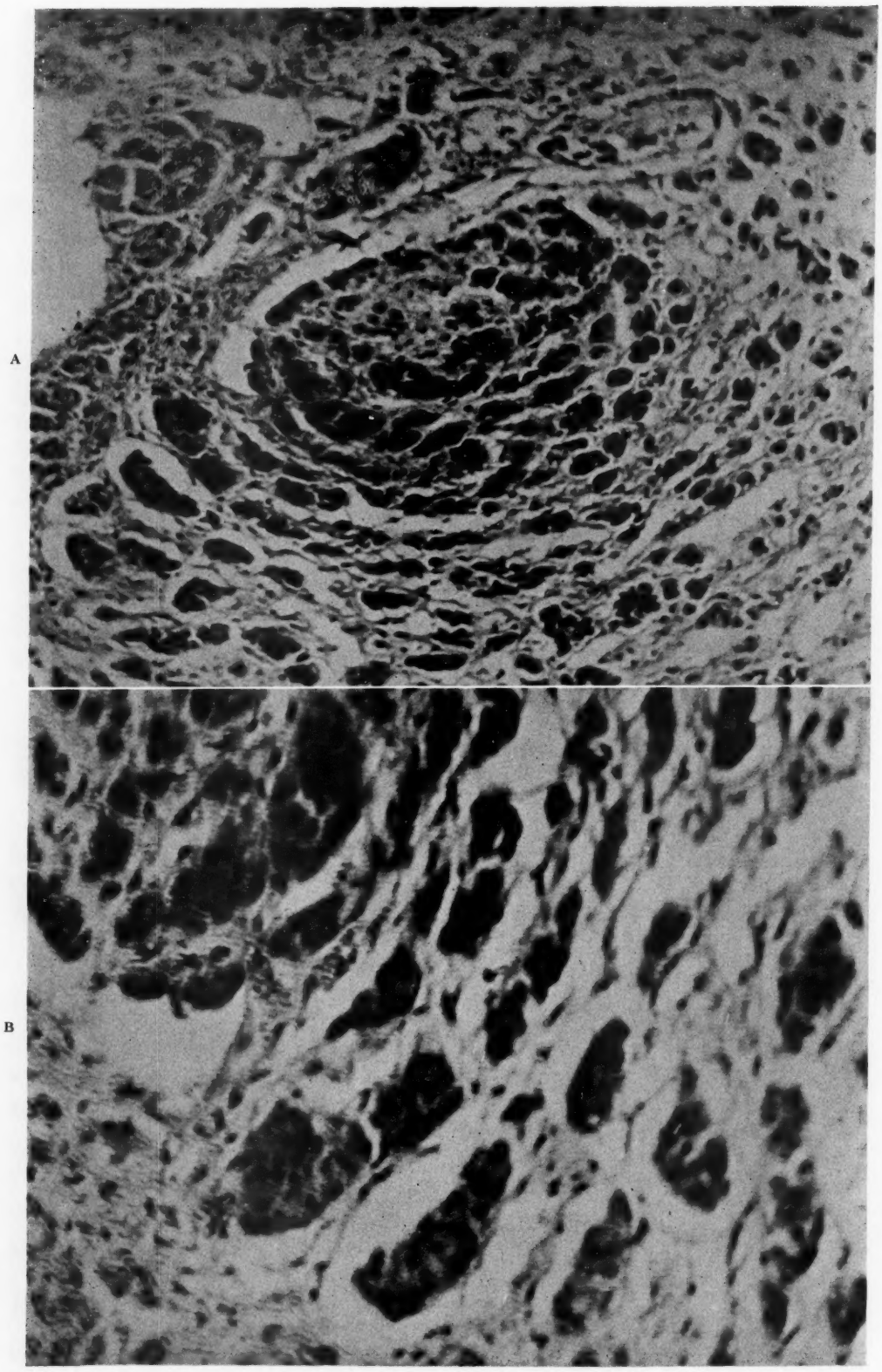

FIG. 6. A, low power photomicrograph of adrenal showing metastatic foci of anaplastic growth resembling those of the kidney tumor. B, high power photomicrograph of adrenal.

plasm of the cells was clear, giving a typical histologic picture of the "clear-cell" type carcinoma. The tumor was very vascular, and the connective tissue stroma was relatively scant. Tumor emboli were also seen.

The metastatic areas in the lungs and left kidney showed essentially the same picture, except that there was a greater anaplasia and atypism. There were numerous cells with giant nuclei and places where a sarcomatous-like picture was seen. The same was true of the metastatic areas in the adrenals. (Fig. 6A and B.) The non-involved areas of the adrenals show a generalized hyperplasia of the cortex. Hypertrophy of the central vein was also seen.

COMMENT

This case presents something of a pathologic museum incorporated in a single body. Aside from other lesions, there is the not very common association of a diffusely metastatic hypernephroma (carcinosis) and calculous disease (calculosis) in the opposite kidney, in the gallbladder and in diverticula of the sigmoid. However, the most striking feature which is scientifically intriguing as well as uncommonly rare, is the association of symptoms of virilism with hypernephroma.

The first question which arises is: are these findings in the nature of a mere coincidence or of a more consequential nature? We believe that in a general way, at least, the latter conclusion can be easily dismissed. For, whatever theory one favors as to the origin of hypernephroma, it seems an established fact that hypernephroma, of itself, produces neither virilism nor any of the other manifestations commonly associated with adrenal tumor. Indeed, this very lack of the androgenital changes characteristic of adrenal involvement is one of the strongest arguments against the adrenal rest origin of hypernephroma. Genital changes occur in several other conditions affecting the endocrine system. Chief among them are the basophilic adenomas of the anterior pituitary, the arrhenoblastomas and, rarely, granulosa cell tumors of the ovaries, and tumors of the pineal body. In our case, none of those conditions were found clinically or at autopsy, and the only remaining source of origin must therefore be sought in the adrenals proper.

The adrenocortical syndrome presents a complex of genital and metabolic changes which have a well established clinical record. In adrenal tumor there is an increase in androgenic hormone secretion and disturbances of the electrolytic metabolism, especially in the sodium-potassium ion concentration in the blood serum. Some of the manifestations of adrenocortical tumor in females are: precocious menstruation before, and amenorrhea after puberty; masculine voice, hypertrichosis, hypertrophy of the clitoris, striae atrophicae of the skin, acne, hypertension, diabetes (frank or latent), premature closure of the epiphyses, and osteoporosis. Such changes have been observed in cortical tumors of the adrenals—in the adenomas and carcinomas—and in the nonneoplastic hyperplasias, especially nodular hyperplasia of the adrenal cortex.

However, there are exceptions to every rule and in this case the exceptions seem to be the rule. Indeed, it is a rare case which bears all the earmarks of that vast symptomatology. Some or all of these manifestations may fail to materialize, even in well established adrenocortical tumors, and still more so in the simple hyperplasias. In our case too, most of the above mentioned symptoms were missing, but the beard-like hypertrichosis, the prominent masculine features and perhaps also the history of marital sterility, when correlated with the findings at autopsy, point strongly to adrenocortical hyperplasia as the causative factor. How much these symptoms were aggravated or brought into clinical prominence by the metastatic invasion of the cancerous growth from the kidney is difficult to decide. If we were to rely on the case history, the facial hair growth seems to have become more noticeable some six to eight months previous to hospital admission. However, too much reliance cannot be put in this kind of reference, and

we shall have to wait for reports of similar cases to clear up this interesting point.

SUMMARY AND CONCLUSION

1. A rare case is presented of hypernephroma associated with multiple calculous disease, adrenocortical hyperplasia and metastatic carcinoma of both adrenals.

2. The origin of hypernephroma is discussed and the current pathologic theories reviewed.

3. A most unusual feature of the case was the presence of marked symptoms of virilism and pronounced facial hypertrichosis.

4. Virilism as one of the manifestations of the adrenocortical syndrome, observed in tumors and hyperplasias of the adrenal cortex, is due to increased secretion of androgenic hormones by hyperfunctioning suprarenals.

5. Hypernephroma of the kidney as such does not produce changes in the secondary sex characters.

6. The question of metastatic carcinoma of the adrenals in relation to the symptoms of virilism is left open for discussion.

REFERENCES

1. Bell, E. T. A classification of renal tumors with observations on the frequency of the various types. *J. Urol.*, 39: 238, 1938.
2. Boyd, W. Surgical Pathology. Philadelphia, 1933. Saunders.
3. Foulds, Scholl and Braasch. Study of histology and mortality in renal tumors. *S. Clin. North America*, 4: 407, 1924.
4. Gilbert, J. B. Diagnosis and treatment of malignant renal tumors. *J. Urol.*, 39: 223, 1938.
5. Hinman, F. Principles and Practice of Urology, Philadelphia, 1935. Saunders.
6. Judd, E. S., and Hand, J. R. Hypernephroma. *J. Urol.*, 22: 10, 1929.
7. Young, H. H. Practice of Urology. Philadelphia, 1926. Saunders.

Correction: Dr. Elmer J. Ball, of Los Angeles, who wrote on "A New Treatment of Ganglion," which appeared in our December, 1940 issue, page 722 wishes to clarify his statement regarding the amount of solution to be used. We quote from his letter as follows:

"I do not believe my article is entirely clear as to the amount of solution; 2 cc. would be the maximum, of course, depending upon the size of the ganglion. The case reported told of 2 cc. of fluid injected into a ganglion 2 cm. in diameter. In such a case 3 to 5 minims would be sufficient—this, of course, is to be accomplished without rupturing the ganglion.

"I would like to emphasize the importance of not rupturing the ganglion and adjusting the dosage to the size of the ganglion. Two or three minims is sufficient for the small ganglion on the wrist."

ESOPHAGOPLEURAL FISTULA: A COMPLICATION OF EMPYEMA

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THAT esophagopleural fistula is a very uncommon occurrence is easily corroborated by the scarcity of available literature on this subject.

Gott[1] reviewed forty cases in 1933 and added four cases of spontaneous rupture of esophagus. This was again reviewed in 1938 by Benson.[2]

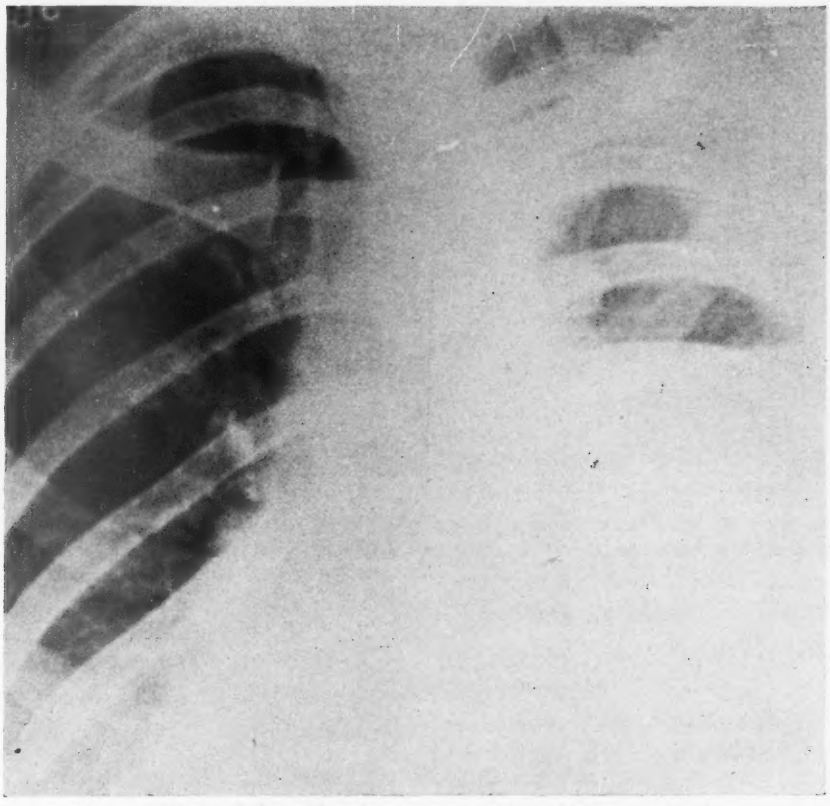
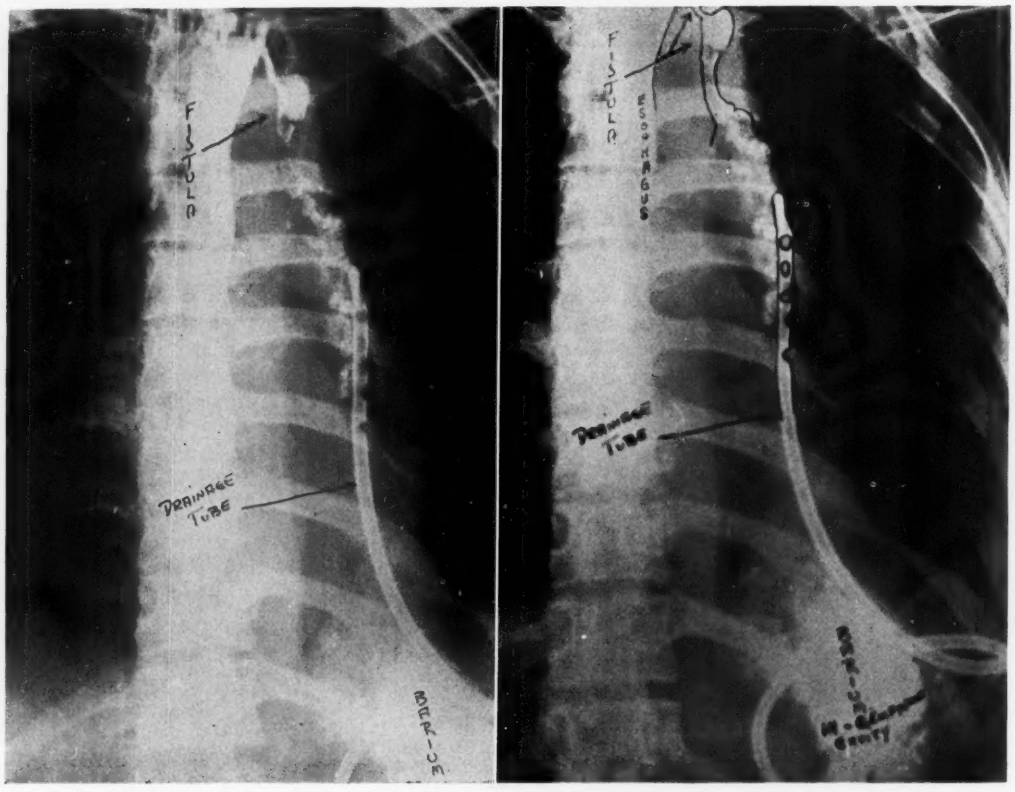


FIG. 1. View of chest showing empyema left, before aspiration.

Such fistulae, when due to foreign bodies, extension into the pleural cavity by carcinomatous ulceration, simple ulceration or diverticulae, or spontaneous rupture associated with severe vomiting, are not too uncommon. The symptomatology in these cases consists of shock, severe substernal pain, subcutaneous emphysema, marked dyspnea and cyanosis. Death may occur within twenty-four to forty-eight hours from a fulminating mediastinitis and pleuritis or secondary pressure pneumothorax.

Most of these reports deal with fistulae originating within the esophagus. Perforation of the esophagus into the pleural cavity, due to purulent pleural infection, diagnosed casually by the appearance of food particles on previous thoracotomy dressings or during irrigation or aspiration of an empyema, is very rare. Only twelve such cases can be found in a review of the literature to date. Kanter and Madoff[3] report one such case besides their own, having its origin from tuberculous caseating

mediastinal lymph nodes; these are not included in the study but tend to show the rarity of involvement of the esophagus from pleural infections.



A B

FIG. 2. A, showing barium in esophagus and outline of fistula leading to pleural space and empyema cavity. B, showing inking in of fistula and esophagus and barium in empyema cavity.

CASE REPORT

A negro female, age 30, school teacher by occupation, complained of pain in the left chest, a dry cough and increase in temperature. She had had "flu" about six weeks before and had been dismissed by her physician after three weeks' treatment. Three weeks later she began to have cough and pain in the left chest.

Examination on May 27, 1936 showed limited expansion of the left chest, dullness to flatness of the left lung posteriorly and absent breath sounds, with tactile and vocal fremitus absent. There was definite displacement of the heart to the right.

X-ray study of chest showed (Fig. 1) complete opacity of the left thorax to the level of second rib. The mediastinum was displaced to right.

Thoracentesis was done and a drainage tube inserted between the eighth and ninth ribs. Aspiration and irrigation with normal saline were carried out. On June 4, 1936 in aspirating the empyema cavity orange pulp was removed. The patient had had orange juice two hours before. She recalled that she had had a rather severe coughing spell after eating cornbread at noon. No pain was noted.

Fluoroscopic study of the esophagus with barium and *x*-ray studies on June 4, with the patient lying on her left side and her head elevated to a 45 degree angle, showed the barium passing into esophagus and down to upper border of the aortic arch where much of it was seen to pass into the pleural space of the left chest. The rest of the meal passed normally down the esophagus into the stomach. (Figs. 2 and 3.)

A Levine tube was passed through the left nostril and secured with adhesive tape. The patient was tube fed thereafter, with marked improvement resulting. On June 18, the tube was removed and barium was given again. A fistula about the size of an ordinary lead pencil still communicated with the left pleural cavity.

Since there had been considerable gain in weight and general improvement in well being, the tube was replaced for another two weeks.

On July 2, 1936, four weeks after the original finding of fistula, barium was again given and no evidence of fistula was found. The catheter in the pleural space was still present. On October 6, no signs of stricture or obstruction of esophagus, and no signs of fistula were seen. In March, 1939, barium could pass through the esophagus with no obstruction, spasm or fistula. The lung fields were clear, the patient had gained 45 pounds and was free of symptoms. (Fig. 4.)

FIG. 3. Semilateral view, showing barium in esophagus and fistula with barium in empyema cavity.

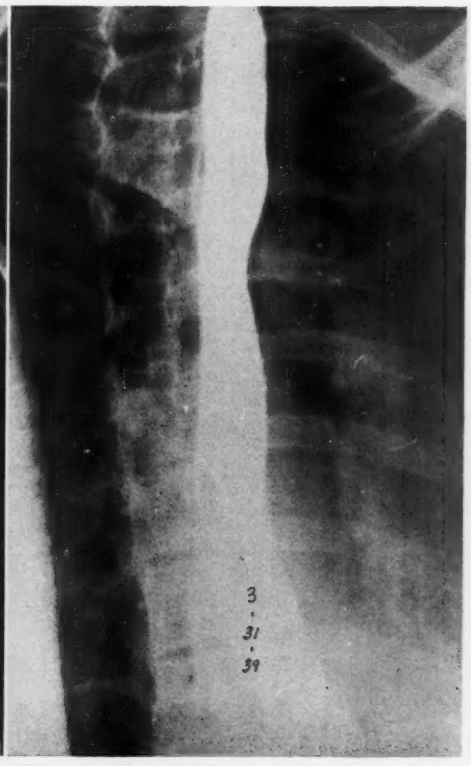


FIG. 4. Two and one-half years after closure of esophageal fistula, showing no constriction and normal filling esophagus.

In a review of the literature we have found twelve reported cases following empyema, the first that of Voelcker in 1891. In Table 1, a summary of the 12 cases and the additional one here reported is given.

The ages ranged from 2½ to 52 years, with an average of 14.8. Only three patients were over 15 years of age and the majority were under 10. Eight patients were male and two were female; in two sex was not given. The left side was involved in nine instances and the right in four. Food or ingested material was noted from two days to six years after drainage, but in most cases the observation was made after original aspiration in about twenty days. The duration before healing or death was as short as two weeks and as long as nine months. Rib resection was done in all cases reported except that of Voss and our own. Tube feedings were first done by Ballin and Saltzstein in 1922, but of the thirteen cases tube feeding was done in only five. Gastrostomy was done in three instances and rectal feeding in one. *X*-ray studies were made in eight and the lesion confirmed. Of the thirteen cases reviewed, five resulted in death, eight in recovery without any demonstrable ill effects, except for one patient who showed marked retraction of the affected side after healing of the fistula.

Only one death occurred in the five cases where tube feeding was used and this was a chronic case of six years' duration. Recovery in this group was seen in a short while—from two to four weeks. There are

TABLE I

Case	Age	Sex	Side of Empyema	Day Food Noted	Duration	Kind of Treatment	*X*-rays	Results
1. Voelcker,[4] 1891	6½	M.	Left	6 months	9½ months	Rib resection	No	Died
2. Thrusfield,[5] 1901	4½	M.	Right	Empyema necessitalis 4 days later	2 weeks	Rib resection	No	Died
3. Arquellada,[6] 1920	9	M.	Left	?	2 weeks	Resection and tube	Yes	Cured 3 weeks
4. Ballin and Saltzstein,[7] 1922	15	M.	Right	8 days	3 weeks	Rib resection and Rehfus tube	Yes	Cured 3 weeks
5. Fonte,[8] 1922	52	M.	Left	1 to 2 yrs.	Months?	Resections; irrigations	Yes	Cured, with retraction of chest
6. Voss,[9] 1923	8	M.	Left	2 days	3 weeks	Esophageal tube feedings	No	Cured
7. McCormick,[10] 1928	Not stated	..	Right	6 years	8 months	Resection four times; tube and gastrostomy	Yes	Died
8. Acuna Bettinotti,[11] 1930	2½	F.	Right	Day of aspiration, milk and pus	?	Rib resection; gastrostomy	No	Died
9. Mikula,[12] 1931	11	?	Right	Day of aspiration	5 months	Resection; gastrostomy	No	Cured
10. Wall,[13] 1932	11	M.	Left	11 days	2 months	Resection; rectal feedings	Yes	Cured
11. Caubarrere,[14] 1934	8	?	Left	6 days	2 months	Resection	Yes	Cured
12. Blauvelt,[15] 1938	27	M.	Left	27 days	9 months	Resection	Yes	Died
13. Torbett, 1936	30	F.	Left	8 days	4 weeks	Tube feedings, thoracotomy	Yes	Cured

no apparent contraindications to this method of treatment.

The etiology is unknown. Probably the process spreads to the mediastinum and esophagus by direct extension in large massive empyemas, causing secondary local erosion into the esophagus. No great distress or discomfort is noted, as is common in conditions arising in the esophagus and spreading to the pleural cavity.

SUMMARY

1. A case of esophagopleural fistula as a complication of empyema is reported.

2. A brief review of cases in the literature is given.

REFERENCES

1. Gott. *Am. J. M. Sc.*, 186: 400, 1933.
2. Benson. *Surgery*, 4: 777, 1938.
3. Kantor. *Am. Rev. Tuberc.*, 35: 190, 1937.
4. Voelcker. *Clin. Soc. Tr.*, 24: 86, 1891.
5. Thrusfield. *Tr. Patb. Soc., London*, 55: 51, 1901–1902.
6. Arquellada. *Med. Ibera*, 10: 77, 1920.
7. Ballin. *Surg., Gynec. & Obst.*, 34: 42, 1922.
8. Fonte. *Brazil M. J.*, 36: 4, 1922.
9. Voss. *Nederl. Tijds. v. geneesk.*, 67: 1940, 1923.
10. McCormick. *Obio State M. J.*, 24: 290, 1928.
11. Bettinotti and Acuna. *Semana med.*, 37: 96, 1930.
12. Mikula. Abstr. *Ann. d'otolaryg.*, 492, 1931.
13. Wall. *J. M. Soc. Georgia*, 21: 71, 1932.
14. Caubarrère. *Ann. d'otorinolaringol. del Uruguay*, 492, 1934.
15. Blauvelt. *Brit. J. Surg.*, 26: 46, 1938.

MULTIPLE CRANIAL LESIONS WITH PORROPSIA AND HYPERACUSIS*

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THE following case has been of unusual interest to us for several reasons. First, the co-existence of osteomyelitis of the skull with an underlying epidural abscess and a chronic subdural hematoma is, we believe, very rare. Second, the patient presented a combination of two uncommon symptoms—porropsia (objects appearing as though they were at a distance) and hyperacusis. Finally, the patient responded very satisfactorily to treatment.

CASE REPORT

History. R. N., a white male, aged 14, was admitted to the Western Pennsylvania Hospital, January 3, 1938. For five years the patient had suffered from osteomyelitis of the pelvis and left femur and during that time had developed metastatic infection of several other bones. In June 1937—seven months before the present admission—he complained of an occasional headache. At about the same time a slightly tender swelling appeared in the occipital region. After one aspiration of pus from beneath the scalp the swelling slowly receded.

The boy was seen by one of us (M. H. W.) in November, 1937. At that time he complained that for about twelve to eighteen months objects in his field of vision occasionally had appeared as though they were at a considerable distance. As the patient described it: "Things look as though I were looking through the wrong end of a telescope." These attacks occurred more commonly at night, but seldom more than once a night. To relieve this symptom he would walk around for a short time and wash his face with cold water—a procedure which invariably caused hyperacusis, or as he put it: "Things all sounded terribly loud." He also complained that for the previous three weeks his head hurt whenever he shook it.

Neurologic examination at that time was entirely negative. At the time of admission to the hospital, January 3, 1938, the attacks of porropsia and hyperacusis were still present, the headaches had become more severe, and the occipital swelling had gradually recurred.

Examination. Physical examination was negative with the exception of the scars of previous operations, a draining sinus on the inner side of the left thigh, and a soft, fluctuant, tender, dollar-sized swelling in the midline about 4 cm. above the occipital protuberance.

Neurologic examination January 5, 1938, showed early changes in the optic fundi, including congested veins and slight blurring of the disc margins; slight pyramidal tract signs on the left, namely, deviation of the tongue to the left, lagging of the left angle of the mouth, slight predominance of the left arm reflexes and left Achilles' reflex.

The spinal fluid pressure was 18 mm. of mercury. The fluid contained 5 W.B.C. per c. mm., no R.B.C. and no globulin.

Beneath the soft tissue swelling the skull showed increased density in the roentgenogram. The change, though slight, was considered sufficient to suggest a diagnosis of osteomyelitis. (Fig. 1.)

The clinical diagnosis was osteomyelitis of the skull with epidural abscess. Operation was advised.

First Operation. On January 6, 1938, an occipital craniectomy was performed (S. N. R.). Two encapsulated and separate abscesses were found in the scalp and drained. The bone was found to be roughened and sclerosed and yet so involved by infection that when the periosteum was rolled back, pus broke through spontaneously from the underlying epidural abscess. A square piece of bone measuring about 2 by 3 inches around the involved area was removed. It was estimated that 15 to 20 cc. of pus escaped from the epidural abscess at this time.

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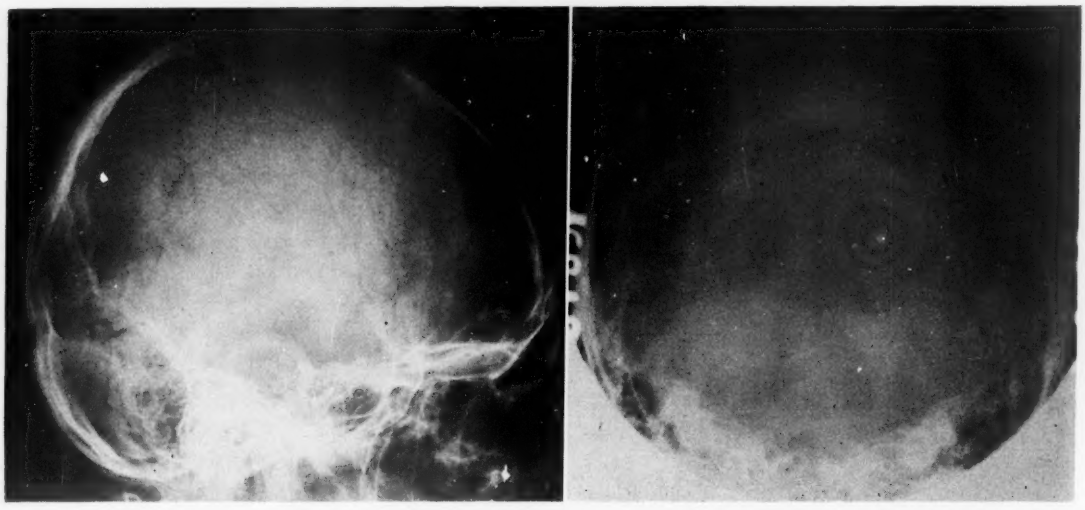
Since the upper margin of the exposed bone appeared infected, an additional strip about ½ by 2 inches was removed with a rongeur. no gas entered the ventricular system, and a ventriculogram was decided upon. Because of the occipital infection, burr holes were made



A B

FIG. 1. Preoperative lateral and basal skull films showing the increased density in the parieto-occipital region.

Arrangements were made for dakinization and the scalp was closed loosely.

The surgical recovery was uneventful, but the patient's headaches and vomiting continued. Lumbar puncture January 14, 1938, showed a spinal fluid pressure of 18 mm. of mercury and a fluid containing 2 W.B.C. per c. mm. and 30 R.B.C. per c. mm.

Nine days after the craniectomy the drainage from the pelvic sinus stopped, leaving the boy free of symptoms with the exception of those referable to the head, namely, bouts of vomiting, headache and an occasional brief attack of porropsia.

On January 16, 1938, the patient was quite drowsy and sleepy, complaining of severe headache. The vessels of the right fundus were congested, and the margins of the left disc obliterated. There was slight weakness of the left face, and the deep reflexes of the left extremities were slightly more active than those on the right. The abdominal reflexes on the left were somewhat diminished. No Babinski was present, but a modification was found bilaterally.

It was felt that the patient might have a right cerebral abscess beneath the occipital infection, but an air injection was planned to confirm the impression before attempting any direct exploration.

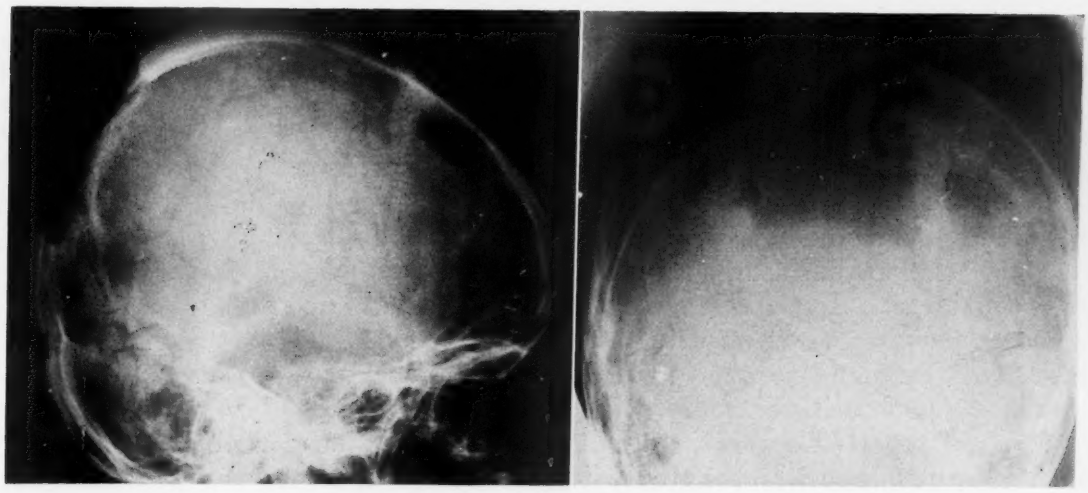
Second Operation. On January 17, 1938, an encephalogram was attempted cautiously, but in the frontal region 3 cm. on either side of the midline. On the right side a subdural collection of old blood was found. The skull opening was then enlarged, and the entire contents of the hematoma evacuated by washing and aspiration. An opening was made in the inner membrane permitting a free flow of cerebrospinal fluid in and out of the sac and the wound closed without drainage.

The patient was immediately relieved of his headaches and vomiting. Slight weakness of the left lower face and a slight hyperreflexia on the left persisted for about two weeks. During this time the papilledema gradually subsided, until the eye grounds returned to normal. On one or two occasions, the boy still complained of transitory porropsia, saying that things looked small and far away.

After discharge, the patient was given disulfanilamide for three months. He also took considerable quantities of vitamins A, B, and D. His general health improved rapidly, and he gained a great deal in weight and height. Six months after the operations his occipital wound ceased to drain, and he was symptom-free for the first time in five years.

A recurrence of the osteomyelitis developed in the left femur in November, 1938 (ten months after the cranial operation) but healed after incision and drainage performed by Dr. M. A. Cohen.

On several occasions in March, 1939, the patient was troubled with brief bouts of blurred vision followed by headache for one or two hours, but there were no attacks of porropsia or hyperacusis.



A B

Fig. 2. Films taken soon after the second operation. The parieto-occipital bone defect and the right frontal opening through which the subdural hematoma was drained are apparent.

When the patient was last seen May 22, 1939, he was symptom-free, and objective neurologic examination was negative. Several large plaques of regenerating bone had nearly filled the occipital skull defect. (Fig. 2.)

DISCUSSION

This case is of interest because of the unusual combination of metastatic osteomyelitis of the skull with chronic subdural hematoma and the attendant diagnostic difficulties, the absence of a definite history of preceding cranial trauma and the presenting symptoms of porropsia and hyperacusis.

The diagnosis of osteomyelitis of the skull was not difficult, although the process proved to be more extensive than the Roentgen films suggested. Furthermore, the presence of an epidural collection of pus was correctly diagnosed because of the patient's preoperative symptoms and signs. When the headaches and vomiting failed to disappear after the removal of the bone infection and underlying exudate, it was suspected that we were dealing with an intracranial lesion, perhaps an abscess. The development of drowsiness, changes in the fundi, and left hemiparesis at this time seemed to confirm this impression. However, it was obvious that exploration for a brain abscess through the infected area was entirely unsafe, and that even a ventriculogram through occipital burr holes was hazardous. Accordingly, an encephalogram was attempted in spite of the known high intracranial pressure. No gas entered the ventricular system, and the slowing pulse and respiratory rates indicated that the procedure added somewhat to the medullary compression.

The patient was then taken to the operating room and preparations made for a ventricular drainage through burr holes in the frontal region. The left ventricle was drained first; but when an attempt was made to expose the right frontal cortex, the hematoma was entirely unexpectedly encountered and readily drained.

Even in retrospect it was difficult to obtain a history of previous trauma to the head in this case. The only history of this sort given was that of being struck on the head by a softball about eighteen months prior to admission. The patient did not have the usual complaints of subdural hematoma, nor did he present any signs to suggest such an intracranial lesion. In fact, at the first examination by one of us (M. H. W.) about six weeks before admis-

sion, he presented no neurologic findings whatever.

A review of the literature for the past fifteen years fails to reveal a similar case, although some cases of cerebral abscess or abscess in other parts of the body in connection with subdural hematoma are mentioned. Furlow[1] reports the case of an old man of 65 with subdural hematoma who had a fracture of the posterior wall of the frontal sinus with an area of infection, from which a sinus extended to a large abscess in the right frontal lobe. In Cabot's[2] case, the pathologic process consisted of a sac containing bloody fluid and purulent material which was sterile on culture. Hada, quoted by Sherwood,[3] reported a case in a child fourteen months of age who suffered with pertussis. Following a whoop he had a convulsion, and five days later, lumbar puncture showed blood and pus in the spinal fluid. Kaplan's[4] case IV developed an abscess of the lung during her convalescence, but the lesion healed with postural drainage. Kaplan does not devote any discussion to the abscess.

Sherwood cites cases, one by Chambers and the one previously mentioned by Hada. In Chamber's case the condition was diagnosed as pachymeningitis, supposedly in connection with mastoiditis and chronic abscess. Hada believed that infectious diseases played a major part in the etiology of pachymeningitis. Zehnder[5] speaks of meningitides with frank hemorrhages, also of bleeding dura following catarrhal infection with sinusitis.

Can we say in this case that the osteomyelitis of the skull and the abscess overlying the dura played a part in the formation of the subdural hematoma? There is no way of answering this question definitely. Neither the fact that the patient presented no neurologic findings only six weeks before admission, nor the eighteen month interval between the supposed trauma and the development of the symptoms militate against the theory that it was the trauma that was primarily responsible for the subdural hematoma. All modern writers agree that trauma is the cause in practically all the cases of subdural hematoma, and that the latent period may extend from a week to three years or longer. Gardner,[6] Kaplan,[4] Jelsma,[7] Furlow,[1] and Zollinger and Gross[8] all stress this point of view.

The visual and auditory disturbances which occurred in this case were difficult to interpret. In the literature references to micropsia (objects appearing small) and porropsia (objects appearing at a distance) are rare and references to the combination of porropsia and hyperacusis are extremely rare.

Higier[9] is the only one to report such a combination of symptoms. His patient, a woman, had a pituitary adenoma. However, Higier believed that the lesion responsible for these two symptoms probably was in the calcarine fissure or cuneus. Higier diagnosed his case as one of "epilepsia tarda endocrina hypophysotoxica." Both Higier and Singer[10] regard porropsia as merely a phase of micropsia. The latter states that "in addition to the objects being small, they also seem far away." Micropsia usually occurs in choroidoretinitis, especially of the syphilitic type. Ball[11] in his discussion says: "Syphilitic choroidoretinitis is a frequent cause of micropsia and megalopsia."

We are unable to offer any localization for the lesion responsible for these two complaints in our case. Since the symptoms disappeared soon after the second operation, we think it safe to assert that they were contiguous symptoms due to pressure either from the subdural hematoma or possibly from the epidural abscess.

SUMMARY

1. A case of occipital metastatic osteomyelitis of the skull with an epidural abscess associated with a right sided chronic subdural hematoma is reported.

2. Among other symptoms the patient complained of porropsia and hyperacusis. A search of the literature reveals only one

other case presenting this combination of symptoms.

3. Surgical extirpation of the infected bone and the discovery and drainage of the subdural hematoma eleven days later resulted in complete relief of the patient's symptoms. When last seen, sixteen months after operation, the patient was free from symptoms, neurologic examination revealed no abnormalities, and the osteomyelitis of the skull was completely healed.

REFERENCES

1. FURLOW, L. F. Chronic subdural hematoma. *Arch. Surg.*, 32: 638, 1936.
2. CABOT, R. *Boston M. & S. J.*, 194: 592, 1926.
3. SHERWOOD, D. Chronic subdural hematoma in infants. *Am. J. Dis. Child.*, 39: 980, 1930.
4. KAPLAN, A. Chronic subdural hematoma; a study of eight cases with special reference to the state of the pupil. *Brain*, 54: 430, 1931.
5. ZEHNDER, M. Die subduralen Hämatome. *Zentralbl. f. Neurochir.*, 2: 339, 1937.
6. GARDNER, W. J. Traumatic subdural hematoma. With particular reference to the latent interval. *Arch. Neurol. & Psychiat.*, 27: 847, 1932.
7. JELSMA, F. Chronic subdural hematoma. *Arch. Surg.*, 21: 128, 1930.
8. ZOLLINGER, R., and GROSS, R. E. Traumatic subdural hematoma. *J. A. M. A.*, 103: 245, 1934.
9. HIGIER, H. Epilepsia tarda encodrina hypophysotoxica cum macropsia, porropsia, hyperakusia. *Polska Gaz.*, 13: 321, 1934.
10. SINGER, G. Micropsia. *Gyogyaszat*, 72: 477, 1932.
11. BALL, J. M. Modern Ophthalmology, 3rd Ed. Philadelphia, 1913. Davis.

THE commonest apical murmur is the cardio-respiratory and this is usually well heard far into the axilla, and is often conspicuous at the angle of the left scapula.

From—"The Soldier's Heart and the Effort Syndrome"—by Thomas Lewis (Shaw and Sons Ltd.).

UNUSUAL COMPLICATION OF TRAUMATIC HEMATOPERITONEUM*

CASE REPORT

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THE striking similarity of the clinical picture of a case of hematohernia resulting from slow intraperitoneal hemorrhage to one of strangulated inguinal hernia with intestinal obstruction is illustrated in this case:

CASE REPORT

A white male, age 43, was working on a large crane at one of the automotive factories in Detroit on December 7, 1939. At 8:45 A.M., the patient's chest was accidentally caught between the shaft and drum of the crane when a mistake in signals occurred. Severely injured, he was immediately taken to the factory hospital for emergency treatment and observation. At 5 P.M. he was transferred to the Henry Ford Hospital. At this time the patient complained of severe pain in the chest and epigastrium which was aggravated by body movements, respirations or cough. There was no history of hemoptysis or shock.

Examination showed a well developed and well nourished adult, white male who was in marked pain. T.P.R. 100-116-30. Respirations were shallow and accompanied by expressions of pain. The motion of the right thorax was definitely limited. A grating noise was audible over the fourth left rib at the costochondral junction. Marked point tenderness was present over the right third, fourth, fifth and sixth ribs in the anterior axillary line and over the left fourth rib at the costochondral junction. Percussion and auscultation of the lungs were essentially negative. The heart sounds were rapid but of good quality. The blood pressure was 120/80. There was muscle spasm and tenderness present in the epigastric region but no rebound tenderness. Normal liver dullness was elicited.

Laboratory data: Urinalysis was essentially negative; white blood count was 30,000 with 96 per cent polymorphonuclear leucocytes.

Roentgen examination of the abdomen and electrocardiographic examination of the heart were negative shortly after his admission.

Chest stereos showed fractures of the second, third and fourth ribs in the right axillary line.

A diagnosis of multiple fractured ribs and possible intra-abdominal injury was made.

Course in Hospital. Since the patient had not been in shock at any time, and since no rupture of a hollow viscus could be demonstrated, conservative treatment with constant observation was carried out. On the second day the patient developed a bronchopneumonia, the pneumococcus type XXI, being demonstrated in the sputum. Sulfapyradine therapy was started. On the fourth day considerable abdominal distention was present. The red blood count had progressively fallen to 2,400,000. It was believed that the patient had been slowly bleeding either into the peritoneal cavity or retroperitoneal tissue, although at no time did his systolic blood pressure fall below 100 mg. of mercury after his admission to the hospital.

Under continued expectant treatment including repeated blood transfusions, hot abdominal stupes, continuous gastric suction, continuous oxygen therapy and sulfapyradine administration, the patient rapidly improved. On the seventh day his temperature had fallen to normal, his abdominal distention had disappeared and the patient looked and felt well for the following four days. Suddenly, during the night of the eleventh day, the patient became worse. He complained of cramping abdominal pain, distention, nausea, repeated vomiting and a painful, irreducible mass in the left inguinal region. T.P.R. was 102^{2}-112-40; leucocyte count was 20,000 with 90 per cent polymorphonuclear leucocytes. Roent-

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gen examination of the abdomen showed dilated loops of the small intestine, indicating the presence of small bowel obstruction. Blood chlorides were 454 mg. per cent and N.P.N. 41.6 mg. per cent.

The presence of intestinal obstruction and the irreducible, tense, tender inguinal mass necessitated the diagnosis of strangulated left inguinal hernia.

Emergency operation was performed under local anesthesia, and a complete left indirect inguinal hernial sac was found. The wall of the sac was tense, thickened and blood stained. The lumen contained old dark liquid blood but no loops of bowel or omentum. The neck of the sac was very narrow and closed by recent fibrinous adhesions and edema. A Bassini type of repair was done including a high ligation of the neck of the sac.

The postoperative course was very stormy, being complicated by high fever, abdominal distention, acute left secondary parotitis and bronchopneumonia. The parotitis subsided under large doses of Lugol's solution, according to the method of Leithauser and Cantor.[1] The pneumonia disappeared after sulfapyradine administration. His condition had improved sufficiently for him to be discharged from the hospital on 1-17-40.

DISCUSSION

In Maingot's "Postgraduate Surgery"[2] is found the following quotation: "Its diagnosis (strangulated hernia) is easier than any other abdominal emergency. A tense, tender, and irreducible swelling at a hernial orifice associated with the general symptoms of obstruction, presents a clinical picture capable of only one interpretation."

In the case presented here, the clinical picture is identical yet no strangulation was present.

In retrospect, this case appears to be one of multiple fractured ribs and slow, continued intraperitoneal hemorrhage secondary to the crushing injury to the lower chest and epigastrium. It was complicated first by pneumonia and intestinal ileus, both of which disappeared under treatment. Later, after continued coughing by the patient, a left inguinal hernial sac became tense and filled with old blood. This was associated with the reappearance of abdominal distention and signs of intestinal obstruction.

REFERENCES

1. Leithauser, D. I. and Cantor, M. O., Lugol's solution in acute secondary parotitis. *Ann. Surg.*, 101: 1171–1174, 1935.
2. Maingot, Rodney, Ed. Postgraduate Surgery, vol. 1, pp. 1034. New York, 1936. D. Appleton-Century Co., Inc.

DUODENAL STASIS COMPLICATING GASTROJEJUNAL ULCER

REPORT OF A CASE

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GASTROJEJUNAL ulceration following gastroenterostomy is a surgical rather than a medical problem. Early surgical intervention is indicated because of the serious complications of gastrojejunal ulcer which may follow undue procrastination. There are five chief complications of gastrojejunal ulcer: (1) recurring hemorrhage; (2) acute perforation; (3) subacute perforation; (4) gastrojejunocolic fistula; and (5) duodenal stasis.

Duodenal stasis as a complication has not been emphasized in the literature although it occurs in about 10 per cent of gastrojejunal ulcers.[1] It is particularly common in gastrojejunal ulcers of long standing. Wilkie[3] says that the tendency to thickening and fibrosis in the region of the stoma leads on the one hand to a gradual narrowing and in some cases to a potential, if not an actual, occlusion of the gastroenterostomy opening, and on the other hand, to an inflammatory induration of the root of the mesentery which interferes with the efflux from the duodenum. Wilkie further points out that failure to overcome duodenal stasis leads to persistence of discomfort and may, if the gastroenterostomy has been simply removed, lead to a recrudescence of the duodenal ulcer.

We are reporting a case of gastrojejunal ulcer of long standing complicated by marked duodenal stasis and perforation which was successfully treated surgically.

CASE REPORT

A male, aged 57, had had a gastroenterostomy eighteen years previously for duodenal ulcer. After the gastroenterostomy he felt better, but continued to have some gastric distress. About five years previous, he began to have pain in the lower abdomen and back, accompanied on several occasions by vomiting. Ten months before the pain had become more severe in the stomach and lower abdomen and tarry stools were noted. Several months of improvement followed, but four days previous to his admission to the hospital he had severe burning pain in the abdomen, which was relieved by inducing vomiting. No diarrhea or tarry stools were noted at this time. The patient reported that he had lost about 10 pounds in weight during the previous two weeks.

Roentgenograms taken after a barium meal showed the duodenum so dilated that it was larger than the stomach. However, the obstruction was not complete as some of the barium passed the site of the gastroenterostomy stoma. (Fig. 1.)

The patient was prepared for operation by keeping the stomach empty with continuous gastric suction for three days. During this time the plasma chlorides, which were low, were brought up to normal by the intravenous administration of glucose and saline. A blood transfusion was given to overcome the serum protein deficiency and injections of thiamin chloride to supply vitamin B_1. At the operation it was found that the omentum was adherent to a perforation of the gastrojejunal ulcer which measured about 1 cm. in diameter. The colon was involved in the inflammatory mass and was densely adherent to the anastomosis, but the wall of the colon was not perforated. The colon was freed by sharp dissection and the gastroenterostomy taken down. The ulcerated portion of the jejunum was resected and its continuity reëstablished by end-to-end anastomosis. The ulcerated portion of the stomach was removed and the stomach closed. There was no evidence of ulceration at the pylorus or first portion of the duodenum and there did not seem to be any constriction at the pylorus. A jejunostomy was made distal to the resected portion of the jejunum and the incision closed without drainage.

During the postoperative period the patient's stomach and duodenum were kept empty by means of continuous gastric suction. Fluids and nourishing formulae were administered

through the jejunostomy tube and vitamin B_1 supplied by daily injections of thiamin chloride. Two blood transfusions were given during the postoperative period. After the first four days the continuous gastric suction was discontinued but the stomach was aspirated twice daily. The gastric retention decreased gradually so that at the end of three weeks it was possible to discontinue the aspirations and start feeding the patient by mouth. The jejunostomy tube was left in for two months as a safety valve. It was removed after roentgenograms showed that the duodenum had returned to normal size and function. (Fig. 2.)

Fig. 1. Roentgenogram of the stomach and duodenum before operation. Note the enormous dilatation of the duodenum.

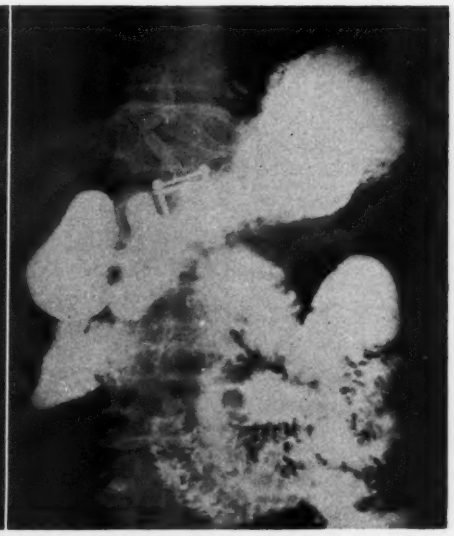

Fig. 2. Roentgenogram of the stomach and duodenum two months after operation. Note the duodenum has returned to normal size and empties normally.

The patient's condition continued to be entirely satisfactory. He gained 41 pounds in weight in the six months following operation, eating an ample but careful diet, and reporting no distress whatsoever.

DISCUSSION

This case illustrates some of the complications which may occur in a gastrojejunal ulcer of long standing. There was perforation of the ulcer, involvement of the colon and marked duodenal stasis. All of these complications add greatly to the surgical risk of gastrojejunal ulcer. In most cases it is best to limit the first operation to closure of the perforation, but in this case the marked duodenal stasis precluded dividing the operation into stages. The ulcer had not perforated through the entire wall of the colon, but it was extensively involved in the inflammatory process.

The question of the best way to handle the very marked duodenal stasis was a difficult one. Wilkie has advised duodenojejunostomy in many of these cases to drain the duodenum. In this case the duodenum returned to normal size and function after relief of the obstruction. Ravdin and his associates have recently shown the importance of vitamin B_1 in maintaining gastrointestinal tone and motility. It is possible that the administration of adequate doses of thiamin chloride may have been a factor in causing the size and function of the duodenum to return to normal. The importance of the jejunostomy in maintaining the patient's fluids and nutrition while the stomach was being kept empty is also demonstrated in this case.

REFERENCES

1. Judd, E. S., and Hoerner, M. T. Jejunal ulcer. *Ann. Surg.*, 102: 1003, 1935.
2. Ravdin, I. S. Factors involved in retardation of gastric emptying after gastric operations. *Pennsylvania M. J.*, 41: 695, 1938.
3. Wilkie, D. P. D. Jejunal ulcer. *Ann. Surg.*, 99: 401, 1934.

DELAYED BREECH EXTRACTION*

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AT some time in every obstetric experience there arises the problem of the refractile and insuperable Bandl's ring. The various means available for obtaining relaxation of the ring are well known and possess one common characteristic: that none is to be absolutely relied upon. The following case report presents a method of management which we have heretofore never employed but which was forced upon us by the exigency of the situation.

Mrs. C. T., age 34, a colored housewife, was admitted to the obstetrical service of Harlem Hospital May 29, 1939 at 1:30 A.M. She had had four previous pregnancies all of which terminated without difficulty. Previous prenatal periods had been uneventful and the Wassermann test was negative. Her largest baby weighed 7 pounds at birth. Her pelvis was classified as generally contracted, the true conjugate measuring 9.5 cm.

Throughout pregnancy the blood pressure was well within normal limits and repeated urinalyses were negative. It was estimated, however, that the baby would be larger than the others had been.

Examination on admission was entirely negative save for a slight pretibial odema, which, in the absence of elevated blood pressure and urinary pathology, was considered as due to pressure on the pelvic vessels. The fundus, measured by the method of MacDonald, was 42 cm. A vertex presented as right occiput posterior. The fetal heart was audible in the right lower quadrant of the abdomen. Irregular contractions were occurring at the time of admission, but the patient fell into active labor within one hour. On rectal examination the cervix was found to be 2 cm. dilated, the membranes were intact and by the Hillis impression, the vertex could be brought to the spines.

Labor proceeded without event until 10:30 A.M. when the cervix was completely dilated and retracted over the presenting vertex. Despite powerful voluntary efforts, no progress was made, even after spontaneous rupture of the membranes at 11:15 A.M. By noon, the patient appeared exhausted; the pulse was running at 110 beats per minute, voluntary efforts were diminishing and the vertex was at station minus 1 with the occiput still in the right posterior quadrant. Operative delivery was decided upon.

Under deep anesthesia effected by ether by the open cone method, Kielland forceps were applied and rotation of the head was attempted without success. Traction to bring the head to a more favorable level for rotation failed. The fetal heart was audible and the forceps were removed. Version and extraction appeared to be the procedure of choice.

The head was firmly fixed in the superior strait and considerable difficulty was encountered in attempting to displace it. When displacement was finally accomplished, the operator encountered a firm contraction ring through which it was impossible to pass the closed fist. Anesthesia was deepened and, with some difficulty, version was completed. After a pause, extraction was attempted and found utterly impossible. Three 15 minim doses of adrenalin were administered in an attempt to overcome the contraction ring, but even these coupled with the profound anesthesia had no noticeable effect. Exploration revealed that the ring had moulded about the fetal pelvis and so firm was its grasp that even almost violent traction failed to achieve progress. At this time, the fetal heart was not heard and in the face of this complete failure, the anesthesia was discontinued. Exactly fifty minutes after anes-

* From the Obstetrical Service, Harlem Hospital.

thesia was first started, attempts to complete delivery were discontinued, the patient was permitted to recover and morphine was given hypodermically. An infusion of 1000 cc. of 5 per cent glucose was started.

The general condition of the patient was fair. The pulse was 120, there was no evidence of shock and there was no bleeding. The contraction ring was now both visible and palpable. The patient was kept on the delivery table and the uterus was constantly observed for signs of relaxation. Under the influence of the morphine, the patient dozed and after the infusion was completed, the pulse had dropped to 102. From 1:00 P.M. to a few minutes after 4:00 P.M. observation continued. It was then believed that the ring was relaxing. At 4:15 anesthesia was begun and under its influence the visible ring disappeared. Palpation showed a soft, pliant uterus and to our surprise, the fetal heart was easily audible, regular in rate and rhythm.

Breech extraction was begun and at 4:50 P.M. a 10 pound 1 ounce baby was easily delivered after application of the Piper forceps to the aftercoming head. The baby was resuscitated with ease. Brisk hemorrhage occurred immediately after delivery; the placenta was removed manually and the uterus thoroughly packed with iodoform gauze. Oxytocics were administered. After reacting from the second anesthesia, the patient was in excellent general condition.

The post partum course of mother and infant was uneventful. Packing was removed on the third day and the patient was discharged on the fourteenth day. The post partum check-up six weeks after delivery revealed good general condition, the presence of a moderate cystorectocele, a firm, healed cervix and a well involuted uterus in good position. The breasts were functioning and the infant was thriving on breast milk.

SUMMARY

We have presented a case in which breech extraction could be accomplished only after four hours of observation following version. It serves to indicate that adrenalin is an unreliable weapon in attacking contraction rings and that morphine, fluids and patience are obstetrical instruments of matchless value and incomparable importance.

Bookshelf Browsing

WILLIAM OF SALICETO—THE SCHOOL OF BOLOGNA

INCUNABULA MEDICA V

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THE medical school and faculty at Bologna were to pass through the same successive stages of growth and decline as that of Salerno, Alexandria and other centers preceding it. The formula in this progress was the same: First a period of initial gathering together of students usually under the influence of some individual who stood head and shoulders above his fellows in technical ability or intellectual knowledge. Gradually from all over the world, the faculty would be enlarged, progress and contribution would be exceptional and worthy and a middle period of the flowering of medical knowledge would follow; finally, a third and last stage of waning influence and a shifting of the scientific and intellectual locale to some other part of Europe. Such had been the history of each medical center and Bologna was to be no exception. The intellectual torch was destined to shift shortly from Bologna to Paris and the University there.

During the period of its greatest activity Bologna contributed many illustrious names other than that of Hugo of Lucca to the history of medicine. These names are prominent because they represent men who did outstanding work in their day. Among these names we find that of William of Saliceto, a brilliant surgeon, considered the greatest of his time. A pupil of his, Lanfranco, was to figure prominently in the actual transition of the center of surgical knowledge and activity from Italy into France.

Guglielmo de Placentinus Saliceto, or William of Saliceto, so named because he was born (in 1210) in Saliceto, a small town near Piacenza and also near Bologna, studied medicine at the medical school of Bologna and received his degree there. Following the completion of his studies he obtained the post of town physician in Verona but remained there only a short time as he was called to the faculty of his alma mater.

While engaged in this task of teaching he contributed much to medical literature. His major work was a "Cyrurgia" consisting of five separate books or parts. Present day terminology would call these chapters. The first book is a rather miscellaneous affair commenting on a variety of illnesses and their treatment, with here and there an original observation or comment of his own. In this book he described quite accurately and completely the symptoms and objective findings we associate today with Bright's disease, and called it "Mal de Renis" or disease of the kidneys. In the thirty-eighth chapter of this book he starts with, "Signa lapidis in Renibus sunt," "the signs of the stone in the kidney are," and proceeds to give as accurate and detailed a description as could be found anywhere today.

The second book deals mainly with contusions in various parts of the body, particularly contusions of the head, and an attempt is made to differentiate between the symptoms encountered in simple concussion and those in cases of fracture.

The third book is devoted to fractures and dislocations with a description of various ingenious devices used in their reduction. Many of these were of his own invention.

TRAC. VII.

et manuum: non enim extrahunt nisi humorem inter E
cutaneum: vt videtur ad sensum.

Propter secundū quomodo fiūt cauteria est sciēn. q; cauteria actualia fiunt cum instrumentis præcipue metallicis Potentialia vero cum medicinis causticis.

Instrumenta autem quibus fiunt cauteria actualia apud antiquos erant diuersa. Moderni vero ea retraxerunt ad certum numerum: vt Guil. de Saliceto ad sex, uel ad octo: Lanfrancus ad decem: Henricus ad septem. Ego vero cōmunia cauteria faciebam cum sex formis: specialia uero cauteria faciebam cum proprijs instrumentis formatis iuxta intentionem quam complere habebam: fiant autem de qualibet forma tria instrumentā paruum, magnum, & medium.

Prima forma est Cultellaris ad formā cultelli facta: & est duplex, Dorsalis scindēs ab vna pte, Ensalis scindens vt ensis a duabus. Et cum isto inciduntur carnes F
superfluę & aperiuntur apāta & rectificātur vlcera.
Cuius forma est talis. A B

Secundum instrumentū est Oliuare nō ad formam folij oliuę: vt putauerunt Gulielmus & Lāfrancus & Hēricus sed oliuarum ossibus simile: vt dicit Halyab. in nono sermone partis secundæ de coquendis capitibus. Qcius operatio etiā ostendit: fiunt enim cū oliuari: in similitate capitis: vt docent prefati magistri: Et iuxta iuncturas propter earum dolorem & super nervos: vt nō profundetur in eorū substantia dū cauteri zantur, ppter putrefactionē: Et super ossā propter magis desiccare dum cauterizantur propter corrosionē.
Cuius forma est talis. C

Tertium instrumētum est Dactylare ad similitudinem ossium dactylorum factum: et ualet ad omnia ad quę oliuare: sed ipsum meliorem formā relinquit post G
se: quia oblongum. & est grossius quam oliuare. Et ideo est præcipuum in vlceribus & ossium & corruptionibus.
Cuius forma est talis. D

Quartum instrumētum est Punctale habens cuspidem gracilem & rotundam cum quo cauterizatur sola cutis. Et est duplex, cum resta & plata: vt non transeat vltrā cutim cum quo fiunt cauteria quæ cōmuniter vocantur ad nodulum in fontanellis brachiorum et tibiarum. Aliud est planum longum ad modum radij cum cannula vt non offendat latera, cū quo cauteri. antur membra, vt fistula lachrymalis, polypus in fra nasum & dentes.
Cuius forma prima est forma ptimi. E F
Forma secundi est talis. G
Cannula est talis. H H
Quintum instrumētum est cauterium subtile cum quo ponuntur setones cum tenaculis latis & perfora- valet autem istud cauterium vt punctalia ad nodulum. sed sunt leuiora & durabiliora: eo quia nodulus egrederetur: & cadit sępe, & indiget ligatura tediosa: seto autem non.
Cuius forma est talis. K
Tenaculę sunt tales. in forma vt hic. I
Sextum instrumentum est Circulare cum quinque additamentis ad faciendum quinque cauteria ad nodum cum plata quinq; foraminibus perforatā super sciam in dolore ipsius & supra humerum et supra gibbositatem humerosam & dolorosam.
Cuius forma est talis vt hic. L M

DOC. I

Modus autē faciendi cauteria actualia, est q; inquiratur bene locus vbi debent poni, & exiccetur, & signetur, & applicata plata aut cannula frigida, si debēt poni: aut sine ipsis vbi non est necesse: firmiter patientem tenēdo: & ignita cauteria bene duo vel quot erūt necessaria vsquequo rubeant: quia tunc erunt meliora: tradantur magistro caute quod patiēs non videat: & imprimantur: & teneantur cum quadam reuolutione, vt non adhæreant carni: fortius tamen in osse: leuius in neruo, vsquequo perdant rubedinem. Et toties reiterentur, quousque habuerit intentum: & postea regantur.

Medicinæ vero cum quibus fiunt cauterīā potentialia, sunt ruptoria: quorum aliqua post se dimittunt escharā, vt calx uiua, et sapo mollis, equaliter de quolibet, drachma. i. vel quantum sufficiet ad operationē mista recenter ǯintequā sint infrigidata: vt dicit Albucāsis addendo quid fuliginis: ut dicit Henricus: aut salis alkali: vt prēcipit Halyabbas. Et de saliua pōit vulgus:

FIG. 1. Illustration of instruments used and devised by William of Saliceto.

Book Four is more interesting than any of the others as it represents the first attempt to write a topographical anatomy. Its weakness lies in the fact that it was not based upon human dissection, but only upon those observations he was able to make as a busy operating surgeon. Many the patient whose operation was prolonged in those times that the surgeon might take advantage of the opportunity to orient himself better anatomically with the area in view!

The fifth book was more or less a materia medica, listing drugs, plants and their uses medicinally. The problem of migraine was apparently as perplexing in his day as in ours if one can judge by the number of

prescriptions he lists for it—seventeen all told. From his dialogue here he made the differential diagnosis of tertian and quartan

DE VLCERIBVS MEMB. ORGA. 59

hæmorrhoidū. Et propter hoc bene dicebat Lanfrācus, ꝙ hæmorrhois erat nomen commune membri & ægritudinis. In ano autem terminantur quinque venæ, quæ hæmorrhoides nuncupantur, vt in anotomia fuit dictum. Et pallio & membrum sic dicitur ab hæmorrhois græce, quod est fluxus sanguinis latine, quia ab illis sanguis exit: & expurgatur saltim vsque ad capita venārum, & saluatur quantum ad surdas: aliquando naturaliter, aliquando præter naturam: loquendo de naturali secundū quid, non vt in fluxu menstruorum, qui simpliciter ad salutem totius speciei ordinatus est, sed partis vt in corporibus melancholiam habentibus. Nā illa præseruat ab ægritudinibus multis, non obstante ꝙ Gal. dixit in sexto de accidenti & morbo, ꝙ omnis fluxus sanguinis est præter naturam. menstruorum commensuratorum supple excepto. Intellexit enim hoc in tertio eiusdem libri aperte dispositionis non naturę regulariter operantis, & sanguinem malum expellentis. Hæmorrhoidum multæ sunt species & differentiæ: quædam enim sumuntur ex parte materiæ, quædam ex parte loci, quædā ex parte annexorum. Ex parte materiæ sumuntur differentię: quia ab omnibus humoribus excepta cholera possunt fieri. morales fiunt a sanguine grosso. verrucales a melancholia. vesicales a phlegmate. vuales ex mediocribus humoribus. Et nominantur ita a similitudine rerum a quibus sumūt nuncupationem, vt habetur ex dictis Auicen. in tertio canoñ. sui.

Ex parte loci quędā sunt manifestę, quędā occultę.

Ex parte annexorum, quia quædam sunt surdę nō fluentes, quædam autem sunt apertæ, & fluentes.

Causa hæmorrhoidum secundum Rabbi Moysen dicitur abundantia sanguinis grossi melancholici vtplurimum: vt raro tamen aliorum secundum ꝙ dictum est: in naturam tamen melancholię approximatorum. Ingrossantur enim, & aduruntur humores ex malo regimine: deinde sua ponderositate ad inferiora descendunt: & replent venas illas, quæ sunt in margine ani, & calefaciunt & dolorant, ex quibus inflantur, & crepantur, & faciunt fluxū. Et eas excitant malę materiæ acutæ, currentes ad locū: aut acutæ medicinæ, velut aloe & scamonea, & cōsimiles istis, vt Hebē Mesue dicit etc.

Signa hæmorrhoidum habentur per visum et tactum, & ad hoc multum iuuat instrumentum dilatatorium speculum dictum: maxime in occultis, quia cum ipso aperitur, & dilatatur anus.

Hæmorrhoides consueuerunt sequi dolores, & grauitates ancharum, & dorsi, & faciei coloratio mala. Et vtplurimū veniunt periodice de mense in mēsem: vel de quarta anni vel de anno. Iudicatur ꝙ si currrunt moderate, conferunt, & bene ferunt: & tūc non sunt restringēdæ, quia præseruāt corpus a lepra, mania, strāguria, & ab ægritudinibus melancholicis.

Si autē superfluant: et nō conferant, restringātur: quia male tolerat patiens: & adducunt hydropisim, aut phtisim. Et in hoc sequitur documētum Hippo. 6. aphorismorum. Hæmorrhoidas antiquas habenti sanari, nisi vna relicta fuerit, periculum erit hydropisim, aut phtisim fieri. Iudicatur etiam, nisi cito occurratur dolori hæmorrhoidum, cito apostemātur, & cito apostema ad fistulam conuertitur.

A **Regimen** hæmorrhoidum est duplex: vniuersale & particulare. Vniuersale regimē habet tres intentiones. vna est in vita, ꝙ non generetur sanguis grossus melancholicus, secunda est in materia antecedenti. ꝙ si generata est, domestice expellatur. tertia est in potionibus, & antidoris proprie talibus ab intra datis, quæ eas deficcant, & sanant.

Primum completur cum debita administratione sex rerum non naturalium, & trium eisdem annexarum. Quas pertractare exquisite esset longum, alterius enim speculationis est. Et cum hoc magister Arnoldus & Rabbi Moysēs multa & diffusa dixerūt de ipsis: sufficit quantum est de pręsenti, scire ꝙ secundum Rabbi. 14. sunt cibi a quibus debent caueri patientes hæmorrhoidēs: videlicet acetum, fabę, lentes, gryssæ, caules rubei, dactyli, pisces grossi, carnes bo-
B uinæ, & caprinę, & sallitę, carnes auium aquaticarū, capita animalium, caseus antiquus, panis aęymus & male coctus, sal, & omnia acuta salsamenta: & omnia quæ dicta fuerunt superius in apostematibus melancholicis. Et cū hoc sūme caueat a cōstipatione vētris.

Secundum completur per acceptionem interpolatam diacatolicon aut diacasia, aut pilularum de bdellio, quæ secundum Rasim, Re. myrabolanorum bellricorum, chebulorum, indorū, ana drac. iiij. serapini, drac. iij. nasturcij, drac. ij. liquiricię rasæ, drac. i. bdellij, drac. xv. cum succo porri, fiant pilulę, dosis sit drac. ij. vsque ad. iij. verum Auic. dicit ꝙ non conferunt in non habentibus periodos.

Tertium completur cum tali electuario probato. Re. myrabolanorum indorum, bellricorum, emblicorum lauatorum cum aqua buglossæ vsquequo di-
C miserint eorum amaritudinem, drac. v. radicis tassi: barbassi, drac. ij. çinçib. cinnamomi, galāgę, nucismu schatæ, olibani, ana drac. i. ameos, spicæ, squinanthi, ana drac. ʒ. scoriæ ferri præparatæ & coctæ cum aceto, vnc. i. penidiarum lib. ʒ. panis çuccari lib. ij. aut plus, si fuerit delicatus, fiat electuarium.

In regimine particulari hæmorrhoidum secundū magistrum Arnoldum duo intēduntur. primum est si nimis fluant, quod restringantur. secundum est ꝙ dolor pro toto posse sedetur.

Primum completur cum tribus. primo ꝙ vitētur acria & acuta, & inflammantia, vt ira, coitus, & exercitium forte: Et ꝙ vtatur delectabilibus, stypticis, nō ante cibum: sed post, propter ventris constipationē, vt sunt pira cocta, & similia, amylū, & rizum, ac hordeū tunc sunt electa, & pedes, et auriculę porcorū, et
D vinum grossum, & stypticum, & aqua ferrata.

Et si fuerit ęstas, potest uti mane et sero syrupo ros. aut myrtino, & citoniorū miua. si vero hyems, laudantur sibi in ieiunio radices trypherū, aut radices tassibarbassi coctæ in syrupo ros. & hoc est secundum.

Tertiū est vt applicētur exterius styptica aliqua, ut delicet in ęstate fiat sacculus ex tribus partibus ros. et vna myrtilloru m, & bulliant vnico feruore in aqua: deinde exprimatur, & supra applicetur. In hyeme uero saluia con qua ssabitur, & fricetur cum multo oleo ros. & in sacculo ponatur, & applicetur, aut desuper ambobus sedeatur. Rasis tamē in restringēdo prę-cipit administrare trochis. de charabe cum sumac. Et super hepar ponere emplastrū de spica in capitulo de debilitate hepatis positum. Præcipit etiā hic Auic. ꝙ fiant ventosæ in spatulis, & applicentur intus, &

Guid. g ij

FIG. 2. The causes, symptoms and treatment of hemorrhoids from Saliceto's "Chirurgia."

malaria and states that in rare cases it was possible for the patient to have both types simultaneously and that when this occurred there was no definite timing of the occurrence of chills—not bad diagnostic acumen for the early part of the thirteenth century.

This book closes with a tirade against overuse of the cautery, which was a prominent custom then and fostered mainly by Arabian authorities. Here credit must be given to the independent mind and spirit of the man. The influence of Constantin and the School of Salerno was felt, even after many years, in the teachings and practice of the School of Bologna. The School of Salerno had been largely Arabian in its own teaching and practice, and had followed

very closely the written words of Rhazes, Avicenna and Avenzoar.

Although William was quite familiar with Arabian medicine, he was not entirely converted to some of its practices, specifically in its use of the cautery. All around him he saw men cauterizing everything because it was the easy thing to do. He urged that the skillful use of the scalpel was a much better procedure and in this fifth book of his, "Surgery," he closes with a plea for those who considered themselves surgeons to adopt his recommendation, and blasts those who dared not change because of their limited abilities.

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est aliquid innouandū. sed dei misericordia' sola expectanda. Sed dolore perseuerante cū tussi: & cum sanie multitudine: et cū virtute forti: maxime si tumor aliquis in parte posteriori lateris appareat extra inter quartam & quintā costam diminutam, fac incisionē nouā penetrantem donec ad locum transeas saniei: & per locum illum saniem extrahe: & illud vulnus nouū teneas apertum: vetus vero solidari permitte. Et si necesse fuerit per illud nouū vulnus lauamentum inijce: & exterius mundificatiuum appone vsq; ad perfectam saniei mundificationem curam illam continua. Nam multoties accidit pro uulnere penetrāte in parte superiori quasi sanguis & sanies inferius supra reflexionē diaphragmatis adunati. quæ quidē reflexio est in loco qui est inter quintā & quartā costam, quem diximus incidendū. Nec potest sanguis & sanies ad vulnus superius habere decursum: et si incidatur inferius, sanies desiccatur: & æger qui alio modo moreretur, fit empyicus. vulnerū thoracis & pectoris si non sunt penetrātia cura ab aliorū curis vulnerū nō mutatur.

De uulneribus spine seu spondylium: & eorum anatomia. tractatus secundi. Cap. VI.

SPōdyles colli diximus esse septē: spōdyles quoq; costarū diximus esse. xij. renū aūt spōdyles sunt. v. spōdyles sub renibus sunt spondyles. iij. super locū q dicitur aboratur alahume. Os caudæ cōpositum est ex tribus spōdylibus. sūt igitur oēs spōdyles. xxx. Est. n. spōdylis os in medio perforatū: per qd foramē trāsit nucha. Et habet vnaquęq; spōdylis, qtuor addi tamēta, et quędā habent plura: quę quidē additamēta ad sensualem operationē chirurgicam, nō est necessarium numerare. Sed hi spondyles cum hoc ꝙ habent foramen magnū, per quod transit nucha, habent alia foramina lateralia, per quæ nerui exeunt: & venę sub intrant. Vnaquæq; ipsarum spondyliū. xxx. cum sua socia, ligamentis fortibus alligatur: quibus spōdyles omnes firmiter, tanquā esset vnum os, adinuicem alligantur. Et illa tota cōiunctio spondylium a talibus spōdylibus inferius vocatur, dorsum seu spina: & est totius corporis fundamentum.

Prognosticatio de vulneribus. Vulnera quę fiūt in his locis nō sunt propter aliud timorosa, nisi quia raro contingit: quin aut nucha incidatur ex transuerso: quæ quidē transuersalis incisio, mortem inducit propter debilitatē nuchę a cerebro, tanquam fluuius a fonte deriuante: aut propter eius lęsionē: quia licet nō incidatur ex toto: sed tamen parum recipiat læsionem motus et sensus membrorum inferiorum impeditur: qui per neruos venientes a nucha motū recipiebant & sensum. Currit autē aliud periculū, ꝙ licet nucha relinquatur illęsa, spōdyles fortiter uulnerētur: aut origines neruorū a nucha uenientiū lędantur: lōga, quę ab vtraq; pte spinę seu dorsi: a capite vsq; ad caudā distēditur: pūgatur. periculū est spasmi propter causas quæ sunt superius declaratæ.

Curatio tamen istorum locorū non differt a curis aliorum vulnerum, nisi ꝙ medico est magis necessariū bona vti prognosticatione: cuiusq; istorum locorum maiori diligentia procurare.

De uulneribus meri. stomachi, intestinorum, & uentris, & eorum anatomia. tractatus secundi. Cap. VII.

DIxisse tibi recolimus qualiter meri per collum transeat: & perforet diaphragma cū quo forti ter alligatur. Cū autē diaphragma transierit circa thoracē, & vnā extremitatē vbi vere os etiam stomachi ampliatur: fitq; stomachi forma talis.

Est enim aliquantulū ab vna parte gibbosus: & ab alia magis planus. Qui quidē ex duobus est compositus panniculis. Interior vero villosus & neruosus: exterior planus & carnosus. In interiori panniculo sunt villi lōgitudinales: per quos fit attractio: & aduenit ei vili transuersales: per quos fit retentio. In exteriori tunica sunt uilli latitudinales: per quos fit expulsio. Interior autē tunica fuit neruosa: vt sua sentiret inanitionē. Exterius fuit carnosa: calidaq; et humida, ut per eā fieret digestio: quia potest digerentis actio peruenire ad rem: quæ digeritur sine tactus occursu. Actualiter autem sensibile non sentit rem tangibilem: nisi cum tactus occurrat. Interior autem pellicula ex cibi succositate nutritur recepti in isto facto. Exterior autem ex sanguine ab hepate delegato per quandam uenam quæ per ipsius stomachi dispergitur substantiam. Similiter autem creatur zirbus, qui stomachi, & intestina sua pinguedine calefacit. In interiori parte stomachi vbi orificium strictus est, superiori orificio continuatur primū ex intestinis quæ sunt septem: qd vocatur duodenū: eo ꝙ est ad mensurā eius, cuius est longum secundū mensuram. xij. pollicum transuersorum: & est ex duabus creatū tunicis: sicut cætera intestina. Secundū intestinum est gracile seu inuolutum. Tertiū est ieiunum, quod semper est vacuū: eo ꝙ fit felli propinquū: multum recipiens de cholera qua ipsum euacuat. & ꝙ ad ipsum plurimæ tendāt meseraicę, per quas etiam euacuatur. Post istud est orbū seu saccus: quod tantū vnum habet orificiū: qd recipit totam fęcē: in quo cōpletur prima intestinorū digestio: & ad hoc vsq; intestinū quædā continuatur ex meseraicis, quæ recipiunt hunc bonitatis residuū: quod ab aliis fugerat intestinis. Post hoc est colon, quod ex ventris transuerso progreditur: quod fęcem recipit ab omni succositate vtili denudatam. Post hoc est longaon, quod in fine quatuor habet musculos: per quos fit retentio fæcū: & ipsarū emissio volutaria: cui tantū associatur expulsio naturalis. Omnis nanq; motus intestinorū naturalis est, & sine lacertis: nisi motus duarū extremitatū: meri scilicet & pudibundi: ibi nanq; naturalis motus cū voluntario sociatur. Fuerunt etiā intestina tribus de causis numero plurimo & inuolutionibus multiplicibus. Inuolutio prima, ne foret necessariū animali cibum sumere: et in continenti ad sellā currere secundū consuetudinē bestialē. Et digestio in stomacho diminuta intestinis plu-

FIG. 3. Description of stomach disorders written by his pupil, Lan Franco, but essentially the work of Saliceto.

This "Cyrurgia" proved to be very popular. There are many incunabula editions of it. The first was printed in the town of Piacenza, in 1476, almost two hundred years after his death; those copies existing prior to that time were only in written manuscript form. A few complete manu-

scripts were available to students in Italy and in France. Translations from the Latin into Italian of parts of the book were available in the medical centers of Bologna, Padua, Milan and Salerno.

Another incunabula edition was printed in Venice in 1490 by the famous Aldus Press, and another edition which just misses the incunabula period was printed by the same press in 1502.

In the interim many translations had been made of the original, one in French, one in English and two partial translations into Hebrew. One of the French translations was printed in Lyons in 1492 and is included in the incunabula group.

He completed another manuscript entitled "Summa Conservationis et Curationis." Like the "Cyrurgia," it also consisted of five parts. Part One was devoted to special pathology, "A Capite Ad Calcem," from "head to heel." Part Two consists of thirty eight chapters devoted to fevers, their diagnosis and treatment. Part Three deals with diseases of the skin and contains several chapters on the use of cosmetics, or the "decorative arts" as it was called. Part Four is a toxicology, describing the toxic symptoms of many drugs and the antidote indicated for each.

As one searches in the old literature of this period, he cannot but be struck with the overemphasis placed upon toxicology and the myriad of "Antidotarium" manuscripts which were written then. One hesitates to assume that so many people used medical means to commit suicide, and one is left to wonder if the art of poisoning enemies was not developed to such a high and efficient degree that extensive knowledge along these lines was called for on the part of the physician. Necessity made familiarity with these many lists of antidotes essential. Almost every physician who had much experience in this sort of practice found incumbent upon himself to publish a list of his own antidotes, otherwise consider himself "declasse."

Part Five of the "Summa" is an "Art of Practicing Medicine" or could be titled, "The Proper Bedside Manner." It consists of a description of the manner in which a history should be taken and the proper diagnostic enquiries which should be made in various types of cases in order to clarify the diagnosis. Interns disgruntled with the prosaic task of taking an extensive history can take either heart or head in the fact that this same procedure has been going on for hundreds of years, as witness a man in the middle of the thirteenth century insisting on a complete detailed history of each of his cases.

In his "Cyrurgia" many authorities claim to find reference to human dissections, and that some of his anatomical descriptions are based upon knowledge and experience greater than that which could be obtained by means of exercising the surgical art per se.

It is well recognized that in addition to being a flourishing medical center during this century, Bologna was at the same time the greatest center of legal teaching in the world. It would not be surprising in view of this if some of the law faculty recognizing the value of postmortem evidence, would not take some means of furthering the possibilities of obtaining such evidence.

The church did not formally prohibit human dissection but did specifically forbid the cutting up of corpses and boiling them in order to separate the bones from the flesh. This strange practice had come about during the Crusades. Many who died during these pilgrimages wished that their bones be repatriated in their own parish at home. As the problem of transportation was an all important factor, and interpretation was made, all too literally, that it was the bones which were to be reburied and not the whole body, resulting in the above practice. Some one some day should write the story of the Crusades from an iconoclastic viewpoint and tear away the beautiful coating of varnish with which they have been ecclesiastically endowed.

It is known that William had as a patient a Franciscan monk from Parma who died suddenly in the street at Bologna. The

law faculty before certifying to the death, insisted that some type of medical post-mortem examination be made to determine more accurately the cause of death. William, as the leading medical authority of the city was chosen to make this examination. It is recorded that as in his own mind the cause of death must be in the heart, he opened only the chest cavity and removed the heart for further study.

If it is accepted that his anatomical drawings and descriptions are based upon human dissection, then his anatomy is the first such work. A glance at some of his anatomical plates would indicate that they are far inferior to those of da Vinci and hardly to be compared with those of the great anatomists who were to come later.

In the later years of his life William took first as a pupil then as an associate, one Lanfranco of Milan, who was to prove worthy of his choice, as through him, William's work and teachings lived on and were to influence another school or center of learning in another part of the world.

This Lanfranco was to take to France that of medicine and surgery which was Italian, and to serve as the torch bearer in the transition of the seat of medical learning from Bologna to Paris. The influence of this great center was to wane gradually and that of Paris to ascend rapidly. The scene once again moves westward, France to have its day, Paris the locale.

William died in 1280 and was buried at Piacenza. In recent years some of the authorities in the field of medical history have raised the controversy that the books in surgery and medicine that have been attributed to him could not possibly have been of his authorship. Entirely too much stress is laid on the fact that printed works of his are exceedingly rare and possessed by only one or two of the great collections in the world. Lists of the works printed during the incunabula period by the Aldine and Giunte presses in Venice fail to mention any manuscript of William's as being used for publication. All of this seems beside the point when one finds hidden away in the haphazard bindings of several works by different authors much material that it is Saliceto's and Lanfranco's.

Selected Book Reviews

WILLIAMS OBSTETRICS*

A TEXTBOOK FOR THE USE OF STUDENTS AND PRACTITIONERS

By Henricus J. Stander, M.D., F.A.C.S.

J. WHITRIDGE WILLIAMS was a gentleman of the old school and a great force for good in American Obstetrics. His textbook went into many editions during his lifetime and thousands of medical students studied its pages. As a text it was outstanding because it was authoritative and its style was moulded along classical lines. About six years ago Dr. Stander, who had been Dr. Williams' associate at Johns Hopkins, and who for the past decade has been Professor of Obstetrics and Gynecology at Cornell University Medical College, undertook the revision of the "last edition of Dr. Williams' textbook, prepared by him in 1930." We are told Stander undertook this work with "some hesitation and a certain amount of misgiving," which we can believe. However, after publication the book was acclaimed by both practitioners and teachers in this country, Canada and abroad.

THE NEW EIGHTH EDITION

It is an old adage that one should not paint the lily, but in this particular case Stander repainted Williams and made an excellent job of it. And now we are offered an Eighth Edition. Stander says, "The book has been almost completely rewritten, with the result that little of the original text remains unaltered. Old chapters have been rearranged and changed, and three new chapters added: 'Diseases and abnormalities of the newly born child,' 'Classification of abnormal and contracted pelves,' and 'Sudden death and maternal mortality.'" Some sections (as that on embryology) have been shortened, while others have been rewritten and new classifications offered.

* Eighth Edition. New York, 1941. D. Appleton-Century Company, Inc.

The author tells us that while different teachings and controversial theories are presented and brought up to date, the reader is left in no doubt as to the author's own views. Most of the text dealing with historical or theoretical considerations appears in small type.

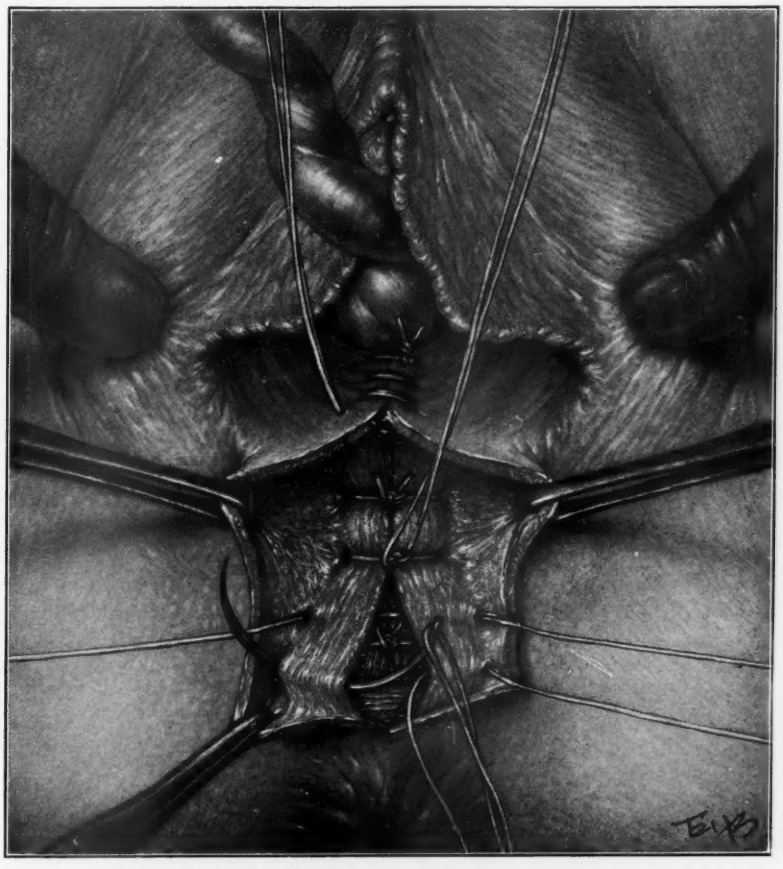

FIG. 1. Repair of Median Episiotomy. Step 3. A second layer of interrupted sutures through the fascia of Colles is sometimes necessary to ensure proper approximation and release of tension on the deeper layer of sutures. (Figure 272, p. 435, in Stander-Williams' Obstetrics, D. Appleton-Century Company, Inc.)

SANE, MODERN, CONSERVATIVE

Nothing could be gained in attempting a critical review of the text. Suffice it to remark that the work is *sane, modern, conservative,* and offers the student everything desired in a textbook; and it is a work the practicing physician will find more than adequate when he refers to it at the time he is faced with a problem.

The illustrations (over seven hundred) are excellent and a great aid to the reader. The Literature appears at the end of each chapter and there is an ample Index.

In his day Williams was the author of a great textbook on Obstetrics. Stander then made a revision and the result is a book called Williams Obstetrics which has little of the original Williams in it. For the most part it is a new work from Stander's pen, and as such

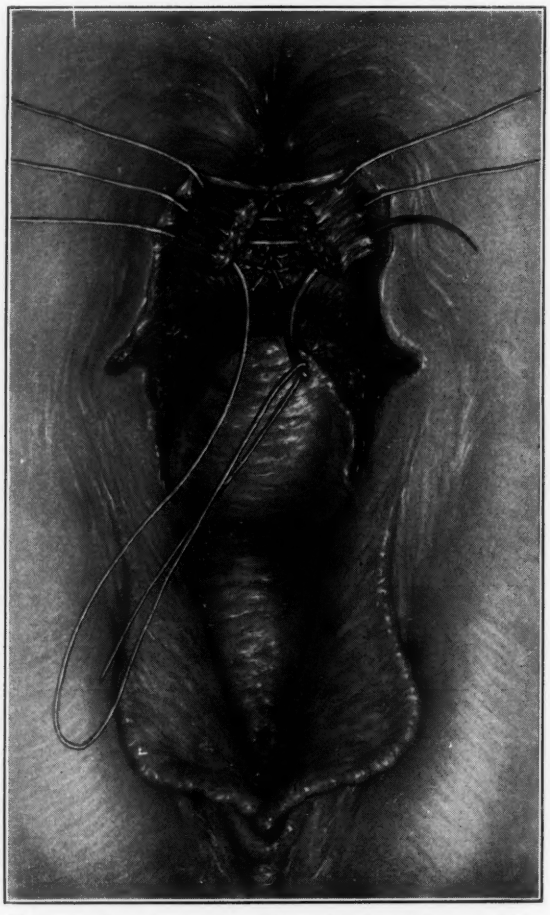

FIG. 2. Repair of Complete Perineal Tear. The rectal mucosa has been repaired with interrupted, fine chromic catgut sutures. The torn ends of the sphincter ani are then approximated with two or three interrupted chromic catgut sutures, after which the wound is repaired along the same lines as outlined in a second degree tear or an episiotomy. (Figure 276, p. 439, in Stander-Williams' Obstetrics, D. Appleton-Century Company, Inc.)

we have another great book on the subject. Every physician, practitioner or specialist who does obstetrics should have this book in his library. Medical students should read and study two or more texts and college teachers might well recommend this work as a "must."

A HISTORY OF MEDICINE*

TRANSLATED FROM THE ITALIAN AND EDITED
BY E. B. KRUMBHAAR, M.D., PH.D.

By Arturo Castiglioni, M.D.

WHEN this book arrived at our office we looked through it, read parts here and there and then turned back to the first page and started to read the book as a whole. We read no other book until we had finished a thousand pages of text—the complete work. And we enjoyed every paragraph and learned a great deal, more than we will ever retain. We recite these facts to impress upon the reader that it is no dry, statistical, encyclopedic work to be used only as a reference but that it is a history of medicine that reads like a lively novel. On the jacket is printed: "This is a detailed survey of the science and art of medicine from prehistoric times down to the year 1940 . . . Its rich information is presented under three aspects: that of ideas, the evolution of medical thought; that of important medical events, discoveries, inventions and achievements; and that of the more prominent medical personages." The whole is presented against the background of the development of art, of social and political life.

THE AUTHOR AND TRANSLATOR

The first Italian edition was published in 1927, when the author was teaching the history of medicine at the University of Padua. At present he is Research Associate in the History of Medicine at Yale University. Dr. E. B. Krumbhaar, Professor of Pathology at the University of Pennsylvania, translated this work from the original Italian and has performed an expert task. We are told that he has adapted it throughout for American readers in collaboration with the author, and has greatly expanded the sections on British and American medicine especially in modern times.

THE PUBLISHER

Typographically, the publisher has done a beautiful job. The illustrations, 443 in number, are well made. There is an appendix, a

* New York, 1941. Alfred A. Knopf. Price $8.50.

bibliography and an index. The reader will find the print easy on the eyes, and if he knows the intricacies of the trade he will recognize that the work is a fine example of the bookmaker's art. The publisher is to be congratulated for offering this wonderful book to both the lay and professional public.

NEED FOR HISTORICAL MEDICINE

Little time is given to the history of medicine in most American medical schools. Some medical colleges devote no hours at all to this subject and many only six or eight lectures. We believe this to be a mistake. No man is efficient in his profession until he knows a great deal about the history of his calling. Should any who teach medical students read this, we hint that they might read Dr. Castiglioni's book themselves, and then suggest to their junior and senior students that they get it and read a chapter every night or every week.

Lay people often desire to give some inexpensive gift to their physician, or a physician often wishes to give a fellow practitioner a gift. Here is the ideal and perfect gift. We are glad this splendid history of medicine has been published. It is sure to stand alone on a high peak for a long, long time.

SPECIAL MONOGRAPH

CANCER OF THE TONSIL

BY

HAYES MARTIN, M.D.

Attending Surgeon, Memorial Hospital

AND

EVERETT L. SUGARBAKER, M.D.

Rockerfeller Fellow in Cancer Research, Memorial Hospital

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CANCER OF THE TONSIL

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AND

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Rockefeller Fellow in Cancer Research, Memorial Hospital
NEW YORK, NEW YORK

CANCER of the tonsil represents about the average of the several anatomic forms of malignant growths of the pharynx from the standpoints of frequency and malignancy. Tonsillar tumors are of particular interest since they comprise a well defined anatomic and histologic group in a region which is readily accessible to either surgery or radiation, so that the possibilities of these two methods in this area may be fully explored and compared.

The present report is based upon 157 unselected consecutive cases of cancer of the tonsil, *including all patients in all stages of the disease* who applied to the Memorial Hospital during the years 1931 to 1935, inclusive. Duffy[15] has reported a preceding series (1920 to 1930) from our clinic.

Definition. In the present report the term, "cancer of the tonsil," designates those growths which arise in the palatine tonsil itself, at its periphery in the tonsillar fossa, in the tonsillar pillars (glossopalatine arch, pharyngopalatine arch), or in the plica triangularis. The term must not be confused with "cancer of the nasopharynx" (pharyngeal tonsil or adenoid) or "cancer of the lingual tonsil" (base of the tongue).

Anatomy of the Tonsil. The palatine tonsils are two large ovoid masses of lymph tissue which are embedded in the side walls of the oral part of the pharynx between the glossopalatine and pharyngopalatine arches. The latter two structures and the adjacent edge of the tongue outline a triangular area with its apex above, which is known as the tonsillar fossa. For purposes of classification, the tonsil should be considered a pharyngeal structure, the line of demarcation between the oral cavity and the pharynx being the free edge of the soft palate and the anterior tonsillar pillar. The tonsil occupies the inferior position in this triangle, and above it near the

apex is the fossa supratonsillaris. From the lower margin of the anterior tonsillar pillar, a fold of mucous membrane, called the plica triangularis, passes backward between the tonsil and the edge of the tongue.

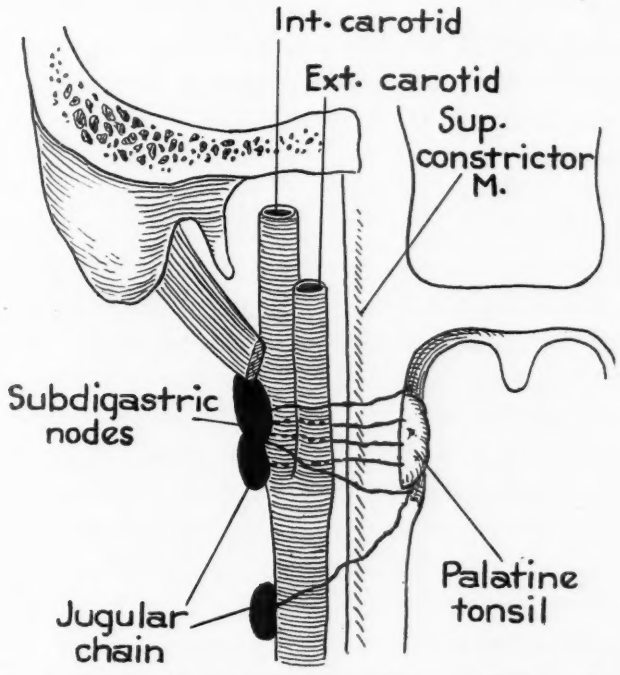

FIG. 1. *The lymph drainage of the palatine tonsil.* From the palatine tonsil the lymph vessels pass directly outward to the subdigastric lymph nodes of the jugular chain which are involved first in practically all cases of metastasis from the tonsil.

The tonsils themselves consist of masses of lymphoid follicles with a delicate connective tissue reticulum. Mesially the surface is covered by a thin layer of mucous membrane and is very irregular because of deep crypts formed by infolding of the epithelium. On the lateral surface the lymph tissue is invested with a rather firm connective tissue capsule which lies directly on the superior constrictor of the pharynx.

The Lymphatic Drainage of the Palatine Tonsil. The collecting trunks of the palatine tonsils are a part of a network which drains the entire pharynx. (Fig. 1.) They perforate the capsule of the tonsil and the superior constrictor, passing successively behind the styloglossus, the stylohyoid and the posterior belly of the digastric muscles to reach the external carotid artery. Most of the trunks then

pass behind the external carotid artery and end in the upper, deep cervical group of the jugular chain of lymph nodes. The principle node of this group lies just above the level of the bifurcation of the common carotid artery and is generally called the subdigastric or tonsillar node. From this node, the lymph drainage flows to the middle and thence to the inferior nodes of the jugular chain. It seems probable that there are only a few by-passes in this area, for metastases from the tonsil seldom appear first below the level of the subdigastric node.

ETIOLOGY

General Incidence. From an analysis of the admission records of the Memorial Hospital, cancer of the tonsil comprises 8 per cent of all cancer of the upper respiratory and alimentary tracts and about 2 per cent of all human cancer. Of the structures of the pharynx, the tonsil (21 per cent) is second only to the extrinsic larynx (37 per cent) in frequency as the site of origin of malignant growths. These figures do not agree with those of Despons[13] who stated that the tonsil is the most frequent site of pharyngeal cancer. It is difficult to explain the findings of Schall[44] who reported that at the Collis B. Huntington Hospital cancer of the tonsil made up 9 per cent of 24,437 cases admitted for all forms of cancer.

Age and Sex. In the present series the average age was about fifty-seven years on admission and about 30 per cent of the patients were in the sixth decade. These figures are almost identical with most other anatomic forms of cancer of the upper respiratory and alimentary tracts in our clinic. The oldest patient was ninety-four, the youngest eleven. As one of us (M.)[29c] has previously reported, cancer in children is not uncommon in the nasopharyngeal tonsil but is apparently rare in the palatine tonsil.

In the present group, 86 per cent of the cases occurred in males and 14 per cent in females, a sex distribution which is almost identical with that of cancer of the tongue as observed in our clinic. There was no significant difference in the ages of males and females. All observers have reported a preponderance in males of cancer of the tonsil: Despons 92 per cent,[13] Nathanson 95 per cent,[38] Schall 89 per cent[44] and Mattick 91 per cent.[31]

Position of the Growth. Since the primary lesion is usually large when first examined, the exact site of origin within the tonsillar fossa cannot be determined in all cases. In over 90 per cent of the

present series, the diameter was more than 2 cm. on admission, with an average of 4 cm. for the whole group. Less than 5 per cent of the tonsillar growths were 1 cm. in diameter or less and could be classified definitely as "early." The right side was involved primarily more often (60 per cent) than the left (40 per cent). Such an irregular distribution has been noted previously by Schall[44] who found 55 per cent on the right and Duffy[15] who found 57 per cent on the left. In our clinic, several forms of intraoral cancer have displayed similar inequalities in distribution; but since the disproportion always tends to be greater in the smaller series, we believe that it can be accounted for entirely by the laws of chance and, therefore, that it has no clinical significance.

Causative Factors. In growths of the palatine tonsil as in other forms of pharyngeal cancer, there appears to be no outstanding etiologic factor. Obviously the pharyngeal walls are not subject to the trauma of mastication nor to irritation from sharp or irregular teeth, which play definite rôles in the causation of cancer of the oral cavity itself. Hot foods and drink, which are held at least momentarily in the oral cavity, pass rapidly through the pharynx during the act of swallowing. Even when smoke is inhaled, the irritating effects of tobacco are confined largely to the oral cavity. In considering others possible etiologic factors, repeated attacks of acute or chronic tonsillitis would appear, theoretically, to be a likely form of chronic irritation in this area, but in our cases, as in the series reported by Berven,[2] the histories failed to reveal any unusual tendency in this regard. The diffuse stomatitis characteristically found in avitaminosis, syphilis, the Plummer-Vinson syndrome and the anemias, may extend to the pharynx and might also theoretically play a part in the etiology of tonsillar cancer, although we have no supporting statistical evidence. Leukoplakia, though occasionally found on the palate and anterior tonsillar pillars, has never in our experience occurred on the tonsils, but Citelli[9] has reported two cases of precancerous leukoplakia on the tonsils themselves.

In our series, about 70 per cent of the patients admitted the use of tobacco, usually smoking; but as we have previously pointed out in discussing other forms of intraoral cancer, at least this percentage of addiction is found in normal male adults of corresponding age. It seems to us that practically all statistical data offered in proof of a connection between smoking and intraoral cancer remain inconclusive. Nevertheless, in our clinic isolated cases

of cancer of the base of the tongue, the tonsil and the soft palate occur with sufficient frequency in heavy cigar smokers (ten to fifteen cigars daily) to lend strong support to the theory of a direct causal relation.

In our group, only 3 per cent of the Wassermann tests taken gave positive reactions, a figure which is identical with the findings of Schall.[44] This proportion is less than the average for the male population of corresponding age (6 per cent).[52] Since the number is not larger, it is undoubtedly only a coincidence that the percentage of syphilis in our series of tonsillar cancer is less than the general average. In any event, it is obvious that syphilis is not a factor in the etiology of cancer of the tonsil.

Poor dental and oral hygiene was observed in the majority of our patients; but since most of them were from the less fortunate economic group, such deficiencies are to be expected and, in the present series, were no more prevalent than among the skin cancer patients in our clinic.

SYMPTOMS, MORBID ANATOMY AND CLINICAL COURSE

In our series the average duration of symptoms (usually pain or "soreness" of the throat) before admission was seven months, as compared to fifteen months in cancer of the lip, ten months in cancer of the nasopharynx and five months in cancer of the tongue and of the floor of the mouth, respectively. Berven[2] reports an interval of four months between the beginning of symptoms and admission to the Radiumhemmet, while Nathanson[38] in his series reports an average delay of one year. In interpreting such figures it is essential to distinguish between the duration of the symptoms and the possible duration of the disease itself. In growths of such areas as the lip or anterior portion of the tongue, where the tactile sense is acute and the areas are under daily observation by the patient, the duration of the disease and the duration of the symptoms are more nearly equal. In the tonsillar area, on the other hand, there is little or no tactile sense and the discovery of the primary lesion by the patient must ordinarily await the development of pain, which may be long deferred. There is no way to determine how long the growth existed in these cases before pain first developed.

In contrast to growths of the oral cavity itself, the most common first complaint in our series of tonsillar cancer was local pain or sore throat (60 per cent). This finding might at first suggest that

this is an early symptom, except for the fact that the average diameter of the primary lesions was almost 4 cm. on admission. An ulcerated infected lesion of the tonsil of this size obviously must be painful, whether or not it produces any other subjective symptoms. Occasionally the growth in the tonsil is associated with such a degree of localized sepsis or cellulitis that the patient complains of pain radiating to the ear before admission, a symptom which is characteristic of advanced and uncontrolled stages of this disease.

After pain in the throat, the next most common symptom was the discovery of an enlarged lymph node in the upper deep cervical region (33 per cent in this series). In forty-four cases in which the patients complained only of enlarged cervical nodes, the primary lesions discovered first by the examining physician averaged 3.5 cm. in diameter. In one of these cases the metastatic node (proved by aspiration biopsy) was treated and permanently controlled by irradiation, and the patient was observed at monthly intervals for almost three years, with repeated examinations of the upper respiratory and alimentary tracts, before the primary lesion (about 5 mm. in diameter) was discovered in the tonsil and proved by biopsy.

The tactile sense of the pharynx is slight in comparison to that of the oral cavity itself. In less than 10 per cent of our cases did the patients state that they first became aware of a "lump in the throat," a disturbance in swallowing or a cough. The primary lesions in this small group were of about average size (3.5 cm.). In three cases of more bulky primary lesions (over 4 cm. in diameter) the first complaint was of earache, a well known form of radiating pain in inflammations of the throat. A few patients first noted such vague symptoms as cough, hoarseness, nosebleed, etc., too varied to be considered of real significance. It is probable that cancer of the tonsil must always reach a size of at least 1.5 to 2 cm. before sufficient infection occurs to cause pain or soreness or any other local symptom. In our series the patients with lesions less than 1.5 cm. in diameter sought medical advice only because of enlarged cervical nodes, and the primary lesions were discovered first by the examining physician.

An early tonsillar growth usually consists of a superficial granular ulcer either in the tonsil itself or in the groove between the tonsil and one of the pillars. (Fig. 2*a* and *b*.) The lesion may arise in a crypt and present only a small portion on the surface. As it enlarges the

tumor usually tends to fungate from and erode the surface of the tonsil, although occasionally, as in lymphosarcoma, it may invade deeply and produce a bulky submucous mass with little or no surface ulceration.

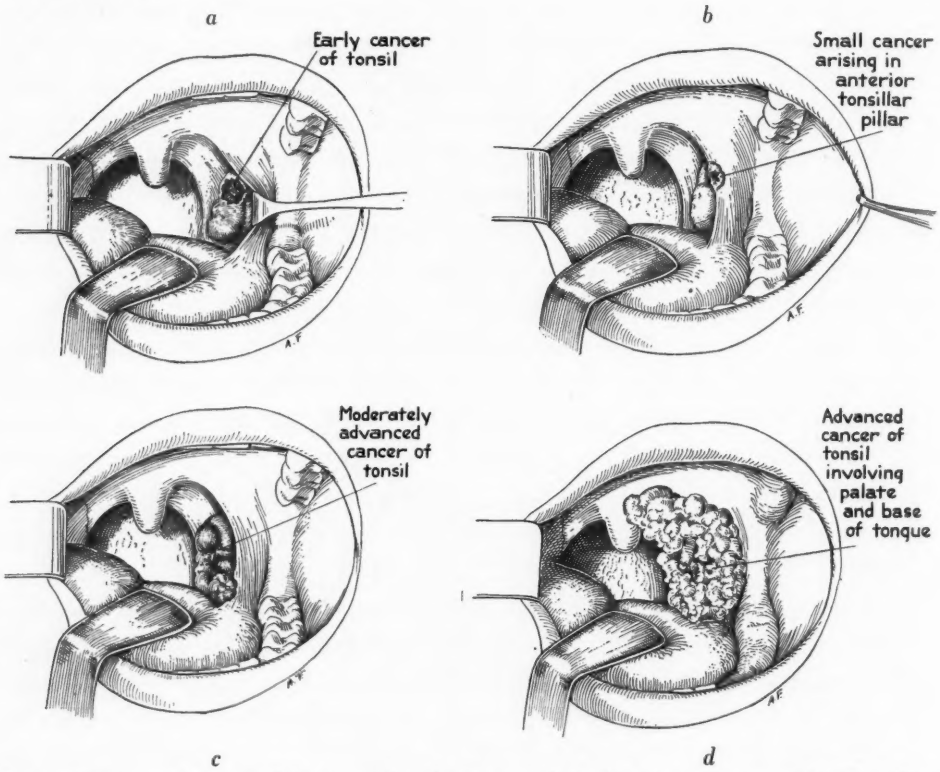

FIG. 2. Cancer of the tonsil begins either in the tonsil itself (*a*) or on one of the tonsillar pillars (*b*). Small lesions (*a* and *b*) or moderately advanced lesions (*c*) are the exception. In the average case the growth on admission has a diameter of about 4 cm. (*d*), so that the exact site of origin cannot be determined, and in these cases the growth has usually invaded the soft palate, both tonsillar pillars and the adjacent edge of the tongue.

By the time the lesion has reached a diameter of about 2 cm., beginning invasion of neighboring structures has taken place, usually in about the following order: the tonsillar pillars, the soft palate, the base of the tongue, the pharyngeal walls, the alveolar ridges and the mucosa of the cheek (Fig. 2*d*.) In its advanced stages the disease may involve the extrinsic larynx or the floor of the mouth and consist of a bulky, irregular, partly necrotic tumor, 5 to 6 cm. in diameter. At this stage intractable pain irradiating to the ear is a fairly constant symptom with trismus as well as dysphagia and pain on movement of the tongue. Hemorrhage due to erosion by the tumor

itself or as the result of radionecrosis is a frequent late symptom. Cervical metastasis is practically always a part of the clinical picture even in the earlier stages of the disease. If the growth is uncontrolled, death occurs from a combination of local causes: exhaustion from pain, sepsis, malnutrition, etc. In the present series, the average length of life in the unsuccessfully treated patients was about nineteen months. Other authors report survival periods varying from six to twenty-eight months: Berven,[2] Cristofordis,[8] Despons[13] and New.[39]

Metastases. In cancer of all parts of Waldeyer's tonsillar ring, metastases play an early and prominent rôle. In the present series about one-third of the patients noted enlarged cervical nodes as the first symptom. On admission clinically demonstrable cervical metastases were present in 76 per cent of the cases and subsequently developed in an additional 3 per cent.* These figures are almost identical with those of Mattick.[31] Other reports in the literature vary from 65 per cent to 92 per cent: Burnam,[4] Schall,[44] Costolow,[10] Levie[27] and New.[39] In thirty-six cases (25 per cent of the determinate group) there was no clinical evidence of metastasis on admission, and the disease was permanently controlled. In seventeen cases (11 per cent of the determinate cases) the patients died of uncontrolled cancer in the tonsil without the development of metastases after an average length of life of nineteen months.

* The question might be raised as to the validity of the diagnosis of cervical metastasis in this series. At the present time, on the Head and Neck Service at the Memorial Hospital all cases of clinically demonstrable cervical metastases are subjected to aspiration biopsy as a matter of routine. In the earlier cases of the present series, not all clinically positive nodes were checked by this means, although of the whole group of 117 cases, in seventy-five (64 per cent) the diagnosis was confirmed by aspiration biopsy or histologic examination of excised nodes. In forty-two cases histologic confirmation was not obtained, and in this group only could there be any doubt. The possible margin of error can be estimated by a comparison of the average accuracy of clinical diagnosis in our clinic from date in another series.

Between the years 1930 and 1938, inclusive, 144 neck dissections were performed under the clinical diagnosis of metastatic cervical cancer (all neck dissections for primary cancer of the submaxillary glands, for carotid body tumors, and for benign diseases such as tuberculosis are excluded). In only twelve (8 per cent) of these did the histologic diagnosis fail to support the clinical diagnosis of metastatic carcinoma. Since in this operable group the disease was early, the chance or error would have been greater than in the average case of metastatic cancer from a primary lesion in the tonsil, which is usually far advanced and readily diagnosed clinically. If we concede a possible error of 8 per cent in the clinical diagnosis of forty-two unproved cases (or three cases), the total number with actual cervical metastases would still be 114, a variation from our reported figure of 117 which is too small to affect seriously the validity of our calculated figures.

The first node involved (in about 95 per cent of all cases) was the subdigastric, which lies in the upper deep cervical or jugular chain just above the bifurcation of the common carotid artery. Occasionally the first palpable metastatic node appeared in the submaxillary region and, more rarely, in the middle and lower parts of the deep cervical chain. Such variations are probably due to anomalies in the cervical lymph system, so that the main lymph stream is diverted past the upper deep cervical nodes through by-passes. After involvement of the subdigastric node, the disease tends to progress down the jugular chain to the clavicle and often into the posterior triangle of the neck along the accessory chain or sometimes into the submaxillary and submental lymph nodes.

When the main lymph drainage channels are blocked by radiation fibrosis or by surgical excision, subsequent lymph drainage must take place by the way of anastomoses, usually through the superficial lymphatics and finally across to the other side. Miliary metastases over large areas of the superficial lymphatics of the neck and cheeks probably always take place in this manner. We have observed this phenomenon in a number of instances of cancer of the oral cavity and pharynx. In one patient of the present series, a metastatic node in the upper deep cervical region appeared to regress completely with the primary lesion under radiation therapy. About three months later there was a recurrence in the tonsil which also responded to irradiation treatment. Several months later a subcutaneous metastasis appeared in the scalp near the occiput, followed shortly by another subcutaneous metastasis on the other side of the occiput with a later spread to the upper deep cervical nodes of the side opposite to that of the primary lesion and the original metastasis.

In nineteen cases (about 15 per cent of those which showed metastases) there were bilateral metastatic nodes on admission, and in one additional case bilateral involvement developed later. One of these patients, in whom the bilateral involvement was proved by aspiration biopsy, survived free of disease for more than five years.

It is a curious fact that dissemination below the clavicle to the viscera appears to occur only rarely. In the autopsy records of the Memorial Hospital there are twenty-nine cases of patients dead of tonsillar cancer with only three instances of visceral metastases (mediastinum, stomach, bones). Despons[13] has also called attention to the rarity of visceral metastases in cancer of the tonsil; and we believe the only reasonable explanation of this fact is that patients

with this form of cancer do not survive long enough, on the average, for the wide dissemination of the disease, although the histologic type of cancer in the tonsil would favor it.

TABLE I

HISTOPATHOLOGY IN CANCER OF THE TONSIL

Epidermoid carcinoma		120
Squamous cell, grade I	4	
Squamous cell, grade II	60	
Squamous cell, grade III	20	
Squamous cell, grade IV	1	
Squamous cell, ungraded	9	
Transitional cell, grade II	3	
Transitional cell, grade III	9	
Transitional cell, grade IV	6	
Lymphoepithelioma	8	
Lymphosarcoma		22
Unclassified*		15
		157

* This includes cases of patients referred for treatment of cervical metastatic cancer after the primary growth in the tonsil had been controlled.

HISTOPATHOLOGY*

A histologic classification of the growths in the series herein reported is given in Table I. The epidermoid carcinomas (84 per cent) and the lymphosarcomas (16 per cent) present about the same relative distribution of these two tumors as in a series of nasopharyngeal

* Dr. Fred Stewart, pathologist to the Memorial Hospital, has recently reviewed all histologic slides in this series and his analysis is as follows:

Tonsillar cancer comprises several more or less well defined histologic entities. The terminology employed in the diagnosis of cancer of the tonsil at the Memorial Hospital is the following:

The designation, "squamous carcinoma," serves to distinguish forms of epidermoid cancer in which keratinization and the occurrence of squamous pearls may be noted even though the cellularity and anaplasia be extremely marked. Degrees of anaplasia are indicated by the grading of the tumor.

The term, "transitional cell carcinoma," is employed to designate a group of epidermoid cancers in which keratinization is absent or essentially absent. Such tumors tend to grow in plexiform character and exhibit varying diffuseness. They resemble the common epidermoid cancer of the uterine cervix which many European writers describe as basal cell epithelioma. The latter expression is not used in this connection at the Memorial Hospital because of possibilities of confusion with the common basal cell epithelioma of the skin. Transitional cell epithelioma may exhibit various degrees of cellularity and anaplasia which are likewise indicated by the grading assigned. Needless to say, squamous and transitional cell cancer may be imperfectly distinguished and there are borderline tumors where specific designation is impossible.

The term, "lymphoepithelioma," introduced by Regaud[42] and later by Schmincke[45] has caused much difficulty. Laboratories are not in agreement as to what constitutes a.

cancer recently studied, which is to be expected since both of these areas are parts of Waldeyer's tonsillar ring. Malignant salivary gland tumors are not uncommon in the palatine tonsil, but none occurred during the period covered by this report. Although the numbers in the separate histologic groups are too small to permit of definite conclusions from a statistical analysis of their respective clinical behaviors, we have attempted to extract certain pertinent data from the available material.

With regard to the primary lesion, the size on admission averaged 4.3 cm. in lymphoepithelioma as compared to 2.9 cm. in transitional cell carcinoma, although the average duration of symptoms was about one month longer (seven months) in transitional cell carcinoma. There was no appreciable difference in the average ages of the various histologic groups. Metastases were present on admission in 96 per cent of the transitional cell cases as compared to about 87 per cent in lymphoepithelioma and lymphosarcoma. There were bilateral

lymphoepithelioma. Thus Ewing[17] states that he examined tumors diagnosed as lymphoepithelioma by Lacassagne and found that they included types diagnosed by himself as transitional cell carcinoma and Schneiderian carcinoma. Tumors in our own collection received from Regaud with the diagnosis of lymphoepithelioma fail to correspond to the structure illustrated by Schmincke in his paper, yet do seem to fit the description furnished by his text, for Schmincke employs the term "syncytiales Karzinom," an apt designation both for the structure of certain primary tumors and for those metastatic deposits in nodes which some pathologists would regard as primary endothelioma of lymph nodes. Schmincke derived the lymphoepithelioma from the reticulum of the tonsil which he accepted as being of epithelial (entodermal) origin. If the reticulum of the tonsil is of epithelial origin, a supposition by no means generally admitted by morphologists, it has so far departed from its original epithelial morphology that it is not surprising that tumors originating from it should be separable with difficulty or not at all from reticulum cell lymphosarcoma. To make the distinction between reticulum cell sarcoma and lymphoepithelioma on the basis of the usual biopsy received in this hospital is almost impossible. Specimens are necessarily small, and since they are taken with forceps from soft tumors easily crushed, the intimate morphology is apt to suffer from distortion. In reviewing specimens formerly diagnosed by us as lymphoepithelioma, we have changed a number to lymphosarcoma and have retained a few, with some hesitancy, as certainly resembling the types described by Regaud and Schmincke. Thus the number of tonsillar lymphosarcomas in the Memorial Hospital records has been increased at the expense of tumors previously diagnosed as lymphoepithelioma. The field of diagnosis of these tonsillar and nasopharyngeal tumors is one of the most difficult in tumor pathology. Unfortunately the clinical course of the disease is by no means helpful in separating the types.

With the exception of one case of Kaposi's hemorrhagic sarcoma which occurred in the tonsil late in the course of generalized disease and one instance of probable granulation tissue sarcoma in a young male, the pathological laboratory at Memorial Hospital contains no instance of tonsillar sarcoma other than lymphosarcoma in one or another of its forms.

metastases in about 15 per cent of the lymphosarcoma and transitional cell groups as compared to 10 per cent in lymphoepithelioma and squamous carcinoma. The histologic grade of the tumor has considerable influence on the clinical course of the disease and especially on the tendency to metastasize, as shown in Chart 1.

Lymphoepithelioma appears to run a much more malignant course, the duration of life from the beginning of symptoms being twelve months as compared to seventeen months in transitional cell carcinoma.

DIAGNOSIS

Biopsy. Although a clinical diagnosis is not difficult in the average case of tonsillar cancer, a biopsy should always be made before treatment is instituted. It should be realized that treatment for cancer, whether by radiation or surgery, must be aggressive and therefore is always attended by definite risk, discomfort and expense. Without biopsy the clinical diagnosis will inevitably be erroneous in an occasional case. If the treatment is to be by radiation, not only should a tissue specimen be removed from the tonsil but an aspiration biopsy should be made for purposes of record to confirm the diagnosis of metastatic nodes.[29d] In the present series, the diagnosis of the primary lesion was confirmed histologically in all cases, and in the majority attempts were made to confirm the character of the enlarged cervical nodes. At the present time, aspiration biopsy of clinically positive metastatic nodes is routine in all cases of intraoral and pharyngeal cancer.

Delay in Diagnosis. On the basis of the average size (4 cm.) of the primary lesions in this series, it is obvious that cancer of the tonsil at the present time is not being diagnosed at an early stage. The most frequent first symptom of this disease, "sore throat," is not alarming to the average layman because it is also so characteristic of the more common acute and chronic tonsillitis and pharyngitis. The fiction of the benign character of cervical lymphadenopathy in the adult (usually metastatic cancer) is often supported by irresponsible medical opinion, and the patient is advised that he has "enlarged glands" and that he should apply hot compresses or massage the area with a well known proprietary ointment containing iodine. It is of interest to note that over fifty years ago Bland Sutton[49] called attention to the malignant character of most asymmetrically enlarged cervical lymph nodes in the adult and stated that he

believed practically all were secondary to undiscovered primary cancer in the mucous membranes of the oral cavity or pharynx. In our series the average interval from the first symptom to the first visit to a doctor was about two months, after which there was an average delay of about five months before the patient finally applied to our clinic with a tentative diagnosis of cancer. The medical profession is, therefore, clearly responsible for an average delay of five months in the diagnosis of this disease.

Chronic Tonsillitis. Since the patient with tonsillar cancer usually complains only of a sore throat when he first consults a doctor, the most common mistaken diagnosis is chronic tonsillitis, for which topical applications and gargles are usually recommended. In our series, tonsillectomy (an accepted method of treatment for chronic tonsillitis) had been performed in thirteen (9 per cent) of the cases before admission, and in nine of these there was gross and microscopic evidence of residual cancer in the pharynx. In only four of the cases had the excised tonsils been examined histologically. It is impossible to say whether these examinations were routine or whether the surgeon or the pathologist had requested the examination because cancer was suspected after gross examination, but it is obvious that most of the operations had been performed under a mistaken diagnosis of chronic tonsillitis. In any case, it is probably unavoidable that early cancer of the tonsil will occasionally be excised by a busy laryngologist, and for this reason the routine examination of all excised tonsils (as practised in many hospitals) is indicated.

A differential diagnosis between cancer and the chronically infected and scarred tonsil, following repeated attacks of acute tonsillitis with peritonsillar abscess, may be very difficult, especially in a patient who has histologically positive metastatic cervical cancer. Chronically infected tonsils usually present deep crypts which, on pressure, extrude inspissated pus with slight bleeding. Careful palpation of both tonsils is of value, with a comparison of the two for any differences in size and consistency. Specimens for histologic examination should be taken from localized indurated areas or from those which bleed on slight trauma. Systematic examinations of the entire upper respiratory and alimentary tracts should obviously also be made in such cases.

Syphilis. From an analysis of the present series, it is apparent that an erroneous diagnosis of syphilis is made less often in cancer of

the tonsil than in malignant growths of the tongue. In only three of our cases had antiluetic treatment been given—in one case for three years and in two cases for six weeks each. Gumma of the tonsil (which cannot be differentiated clinically from cancer) is exceptionally rare. In the records of our clinic going back to 1925, during which time over 450 cases of tonsillar cancer were treated, only one instance of gumma of the tonsil is recorded. The diagnosis was established by a biopsy of the tonsil, a positive Wassermann test and complete regression of the lesion in less than a month under antiluetic therapy.

Papilloma. This benign tumor occurs on the tonsil about as frequently as in any other area of similar size in the oral cavity or pharynx. Such growths have a warty papillary appearance, and show a greater tendency than cancer to fungate from the mucous surface. The diagnosis may be suspected from the clinical appearance, but final confirmation by histologic examination is required. The treatment is by narrow excision either by scalpel or endothermy. During the period covered by this report, one case of papilloma of the tonsil was seen at Memorial Hospital.

Rarely, patients with leukemia present markedly enlarged tonsils as well as generalized lymphadenopathy, but errors in diagnosis cannot occur with proper laboratory and physical examinations. Occasionally, patients with acute peritonsillar abscess, simple granuloma, actinomycosis and retention cysts are referred to a cancer clinic for a differential diagnosis. If biopsy is routine in the diagnosis of all suspected superficial cancer, these conditions will present no special problem.

GENERAL PRINCIPLES IN TREATMENT OF CANCER OF THE TONSIL

There is no structure of the pharynx more accessible to surgical removal than the tonsil. It performs no vital function and may be completely excised without great operative risk or postoperative shock. For benign diseases of the tonsil, tonsillectomy has long been one of the most successful of surgical operations, and from the theoretical standpoint alone early cancer of the tonsil should be amenable to surgical excision.

Despite these theoretical advantages, surgery offers little in the treatment of this disease, since the primary lesions are seldom small or sufficiently localized in the tonsillar fossa to be operable when first seen. In our series of 157 cases, the growths averaged about 4 cm. in diameter on admission. There were only two (about 1 per cent) in

which the primary lesion was 1 cm. or less, and in both of these metastases were already clinically demonstrable on admission, an indication in general of the inoperability of this disease. Simmons[48] found only one operable case among fifty-four patients with cancer of the tonsil. The literature from 1870 to 1910 contains a few reports on the surgical treatment of cancer of the tonsil, after which time, with the development of scientific radiation therapy, the surgical reports have steadily diminished in number as the suitability of radiation therapy in this disease has been demonstrated.

The earlier writers reported an operability of 40 to 60 per cent; but on weighing the evidence one must conclude that their surgical judgment in this regard was hardly sound since their operative mortality was about 30 per cent, and they appear to have obtained practically no cures. The simplest form of operation, tonsillectomy through the open mouth, was advised by Butlin.[5] Jacobson[20] recommended splitting of the cheek from the commissure back as in Jaeger's exposure for cancer of the tongue. In this cheek splitting operation and in all the more extensive procedures subsequently developed, most of the authors suggested preliminary tracheotomy as well as temporary ligation of the common carotid artery.

In order to excise the tonsillar area more widely, Mikulicz,[37] Langenbeck,[26] von Bergman[1] and Kocher[24] advised a vertical section of the mandible just anterior to the ascending ramus and a disarticulation of the ascending ramus and its removal with a portion of the lateral pharyngeal wall, including the tonsil and the growth. Sedillot's[46] exposure for cancer of the tongue was also recommended —sectioning the lower lip and mandible at the symphysis, the incision being continued backward in the floor of the mouth to the anterior tonsillar pillar, after which the mandibular fragments could be retracted laterally to obtain access to the tonsillar area. Another approach to the tonsil was by a lateral pharyngotomy,[7] the opening being made through the side of the neck without incising the cheek. Such an operation has recently been popularized[51] for various malignant growths of the pharynx. Jacobson took exception to Butlin's statement that simple tonsillectomy was the most suitable operation for cancer of the tonsil and maintained that the more extensive operations produced the longest periods of survival. Despite Jacobson's staunch support of the more radical procedures, however, he was able to report only one cure (eleven years) among an unstated number of his own cases. Eggers[16] has recently described and

advocated several of these old technics with no essential modifications, but he includes no cures nor case reports.

In the final analysis, one must conclude from its history that the operative treatment of cancer of the tonsil justifies Despons' epithet of "surgery of despair."[13] The reasons for the failure of surgery in cancer of the tonsil are, first, that the primary lesions are extensive and inoperable when first seen and, second, that 75 per cent of all cases have metastases on admission. Even though both the primary lesion and the cervical metastases were operable (as is rarely the case), the prudent surgeon will concede that a wide excision of the tonsillar tumor through the mouth cannot be combined safely with a block dissection of the neck at the same operation, nor can the block dissection be performed safely until at least partial healing has occurred in the pharynx. Such a delay would usually result in allowing the cervical metastases to become inoperable. Furthermore, it would be injudicious to combine block dissection of the neck with lateral pharyngotomy; and if the pharyngotomy were done first, the scarring of the neck would preclude the performance of an adequate neck dissection subsequently. As we have already mentioned, simple tonsillectomy had been performed in fifteen cases of the present series before the patients were admitted to our clinic. Of these, four patients had no recurrence in the tonsil and, superficially considered, these successful results might be considered surgical cures, except for the fact that all were treated for cervical metastases and the tonsillar area was included in the beam of radiation exactly as if the growth in the tonsil had never been removed. The cure rate in these fifteen cases (27 per cent) is better than the average, which is undoubtedly due to the fact that all were obviously relatively early when first treated.

While surgery offers little, radiation therapy is particularly suitable in tonsillar cancer. This area is accessible to irradiation both through the skin of the neck and through the mouth by a peroral portal. Cancer of the tonsil, in general, is among the more radiosensitive of pharyngeal and oral tumors, and the upper portion of the pharynx, in contrast to the hypopharynx, can be heavily irradiated without seriously impairing any vital function or bringing on grave complications. The most frequent site of metastasis in cancer of the tonsil is the subdigastric lymph node which lies in the upper deep cervical region only a little below the level of the tonsil itself. This almost direct superposition of the first and most frequently involved

lymph node permits of the irradiation of both the primary lesion and the metastases through the same portal, which avoids the use of portals so large as to tax severely the patient's general tolerance. By contrast, in cancer of the nasopharynx the primary lesion and the metastases are widely separated and each must be irradiated through individual portals, thereby resulting in a greater tax upon general tolerance.

The first form of radiation treatment for tonsillar cancer was the implantation of seeds or interstitial needles.[21] At the Memorial Hospital Janeway and Quick,[21,41] in 1917, employed bare glass radon seeds interstitially, supplemented by moderate doses of external radiation (radium packs or *x*-ray). With the development by Coutard[11] of the principle of fractionated *x*-radiation, this growth was one of the first in which the method was found successful. Berven,[2] in 1931, reported success by the use of fractionated doses of radium element pack. He has also published the description of an elaborate device for holding radium plaques in contact with the tonsil, which to us does not seem practical for a number of reasons.

Beginning about 1930, we attempted at the Memorial Hospital to sterilize tonsillar growths by the use of fractionated *x*-radiation. Further experience has revealed that permanent regression by this method alone often necessitates pushing the dosage beyond the limit of the patient's immediate general tolerance or beyond the point at which the local tissues will recover to an acceptable degree. It has since been found that the number of permanent cures can be increased and the percentage of untoward sequelae reduced by using submaximal doses of fractionated *x*-radiation, supplemented in most cases by the implantation of small doses of radon seeds in the residual tumor, either directly into the primary lesion or in immediately adjacent metastatic nodes.

A review of the recent publications on tonsillar cancer reveals some diversity of opinion as to the preferable method of treatment.[6,12,18,19,22,23,28,34,43,47] The method most commonly advised is fractionated *x*-radiation and next in order is fractionated treatment by radium element packs. A minority recommend radon needles or seeds alone or combined with surface applications of radium. Among these authors, only those who depend mainly upon fractionated radiation by *x*-ray or radium element packs report five-year cures.

General Hygienic Measures. The adequate radiation treatment of any form of pharyngeal cancer is a severe tax on the patient's

general strength. In the larger growths there is almost always a marked local sepsis; and if swallowing has been painful, there is at least some degree of malnutrition. The convalescence may be short-

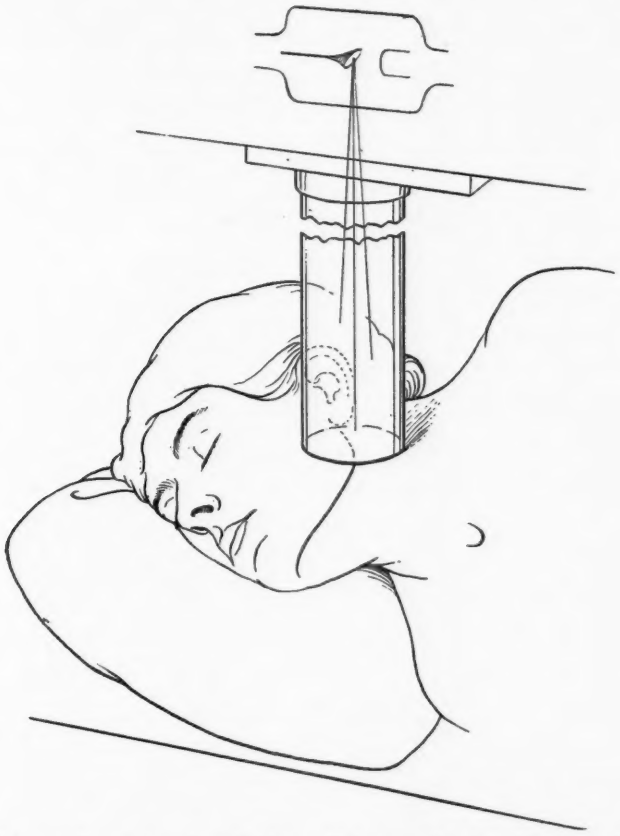

FIG. 3. In external radiation of the tonsil, the skin portal should be centered about over the angle of the jaw and the beam pointed horizontally toward the opposite angle. Accuracy in treatment is favored by metal cylinders which exactly determine the size of the portal and remain in contact with the skin, steadying the patient during treatment.

ened and the severity of the complications greatly reduced if the patient can be hospitalized for a month or six weeks during and immediately following radiation treatment. If hospitalization is not practicable during this long a period, it should be arranged for at least two weeks during the height of the reaction. At the beginning of treatment, measures should be taken to counteract the various complications which may already be present, as we shall discuss presently under "Complications."

Treatment of the Primary Lesion. Treatment should begin with fractionated external radiation given through the cheeks and sides of the neck and, provided that the lesion does not extend downward onto the pharyngeal wall, peroral *x*-radiation through the open mouth. To irradiate the tonsil, the external portals should be centered about at the angles of the mandibles (Fig. 3), the exact position varying with the individual case as determined after careful examination. Metastases are most often located over the carotid bulb (2 to 2.5 cm. below and a little behind the angle of the mandible), in which case the portal should be slightly larger (8 rather than 7 cm.) and centered nearly over the node with the beam tilted upward and forward toward the tonsil. Even though the position of such an external portal may seem fairly obvious, in relation to some fixed anatomic structure, nevertheless we find it of advantage to mark the center of the portal accurately by tattooing with India ink.* The external portals should be circular in order to be most efficient,† and the size should be about 7 cm. in diameter unless there are definite reasons for making it larger, such as the widespread distribution of cervical nodes or an unusually large primary lesion, when the portals may be 8, 9, 10 cm. or more in diameter. Ordinarily, if a portal must be over 8 cm. in diameter, it is of advantage to make it oval rather than circular, so as to avoid as much as possible the irradiation of an unnecessarily large volume of tissue.

If the primary lesion is of average size and confined to the tonsil itself, and if the jaws can be separated widely enough to admit a cylinder at least 4 cm. in diameter, peroral *x*-radiation should also be given. For this purpose, metal cylinders of various diameters are used, specially equipped with master cylinders so that the desired size and distance may be selected for the individual case. One of us (M.) has already published a description of such applicators and their several indications.[29a] Recently we have devised an electrically lighted periscope which permits checking the accurate centering of

* The skin is cleansed by rubbing with alcohol, and a small drop of India ink is placed at the desired point. With a sterile sharp needle, six to eight punctures are made through the ink into the skin, and the excess ink wiped off. The tattoo mark will remain permanently, and its size depends on the number of punctures. If later considered unsightly, it may be excised through a small ellipse.

† Square and circular portals of equal diameter are about equally efficient if centered over a deep-lying mass, since the edge of the beam at its closest point is at the same distance from the edge of the tumor in either case. The area of a square is 25 per cent larger than that of an inscribed circle, and therefore a circular portal is to be preferred since it accomplishes the same result with a smaller area.

such peroral portals by indirect vision. (Fig. 4.) It is fortunate if the patient is edentulous in the beginning; but if not, we believe that the

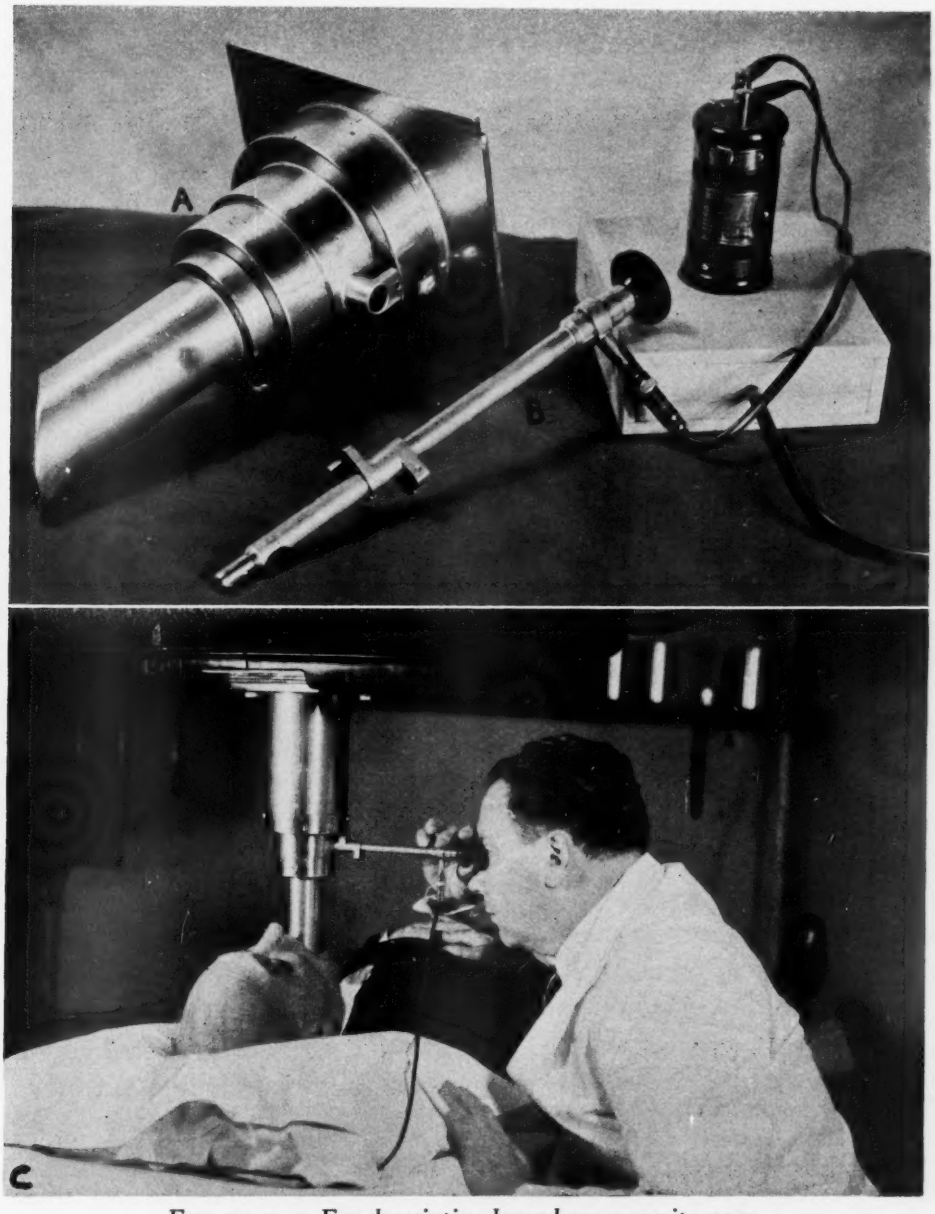

FIG. 4A, B, C. For descriptive legend see opposite page.

extraction even of sound teeth is justified when peroral *x*-radiation is indicated and there is no other impediment to its administration.

With portals averaging 7 to 8 cm. in diameter (other factors being: 200 to 250 kv., 50 to 60 T.S.D., filter 0.5 to 1.0 mm. Cu) the

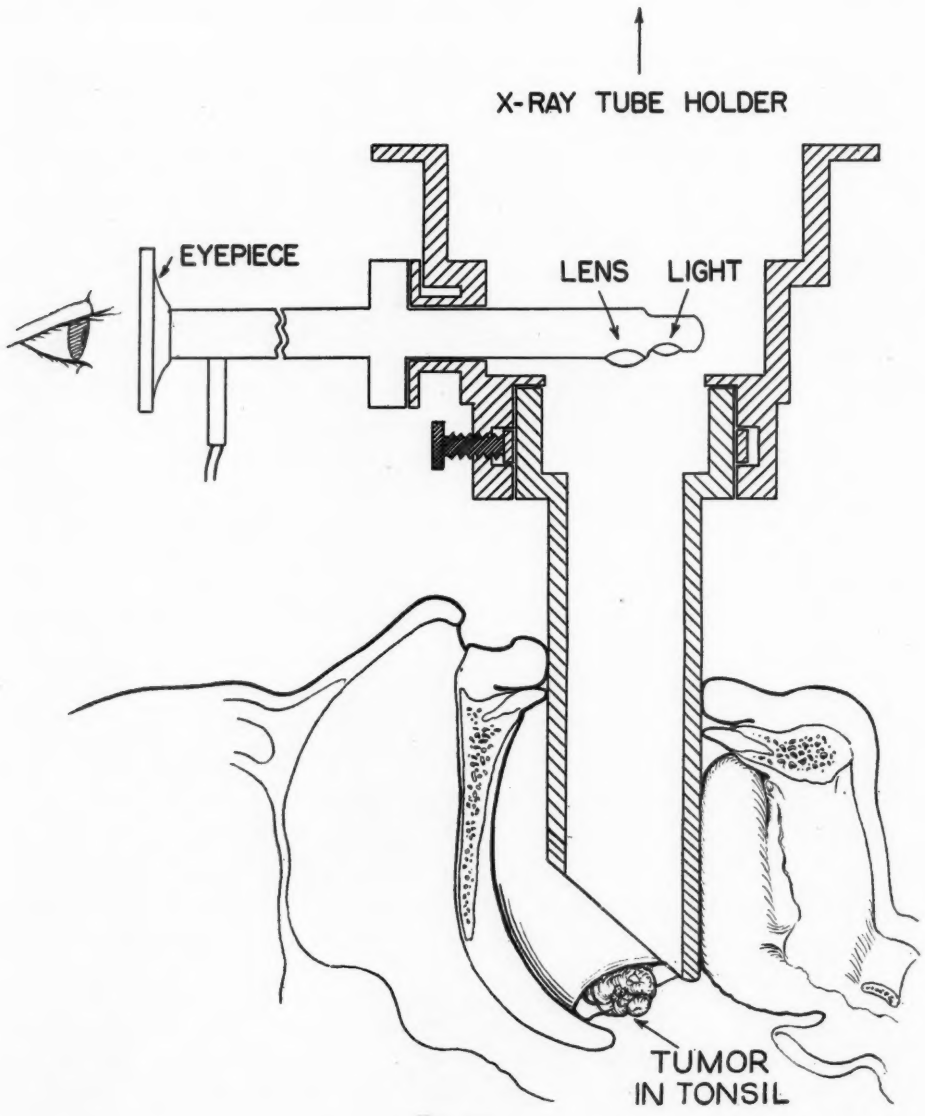

FIG. 4D.

FIG. 4. For peroral *x*-radiation, a useful attachment is an electrically lighted periscope by which the accurate centering of the peroral cylinder over the lesion may be checked at the completion of the setup. A, master cylinder with a peroral cylinder attached; B, electrically lighted periscope; C, checking the accuracy of a peroral setup with the periscope; D, diagram of construction of peroral cylinder and electrically lighted periscope. (The lens system and periscope were made by the American Cystoscope Makers, Inc., New York City, and all other attachments by Mr. A. Schreiner, Master Mechanic of Memorial Hospital, New York City.)

daily dose should be about 350 r given to alternate sides until a dose of about 3,500 r times 2 has been administered. If a peroral portal can also be used, the single dose with a 4 cm. portal should be about 400 r

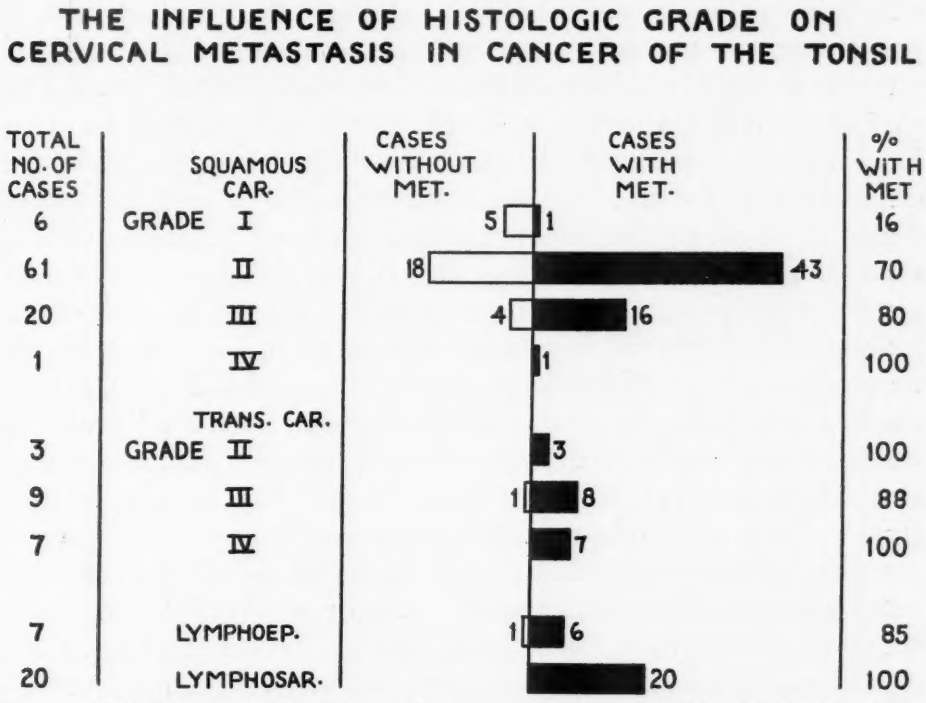

CHART 1. The frequency of metastases in cancer of the tonsil varies with the histologic grade of the tumor from 16 per cent in squamous carcinoma grade I to 100 per cent in squamous carcinoma grade IV, transitional cell carcinoma and lymphosarcoma.

given in rotation with the external cheek portals, the total dose being about 2,500 r times 2 through the cheek portals and 2,800 r through the peroral portal. After the completion of such dosage by one or the other of the above mentioned plans, it should be decided whether the depth of the reaction and the degree of regression of the tumor indicates continuing with the external radiation beyond this point or whether further treatment should be given by radon seeds implanted in the metastatic nodes and also in the primary lesion. By external radiation alone, using two skin portals 7 to 8 cm. in diameter and with the other factors as above mentioned, the total dose may be raised justifiably to 4,000 r or even 4,500 r times 2. If a peroral portal is used in addition, the total dose may be as high as 3,000 r or 3,500 r times 2 plus 3,500 r through the peroral portal.

A better plan than either one of these is the administration of external radiation until the tumor has been reduced to a quarter or a

fifth of its original size after which supplementary treatment is given with radon seeds. By such supplementary radon treatment, many of the undesirable effects of large doses of *x*-radiation may be eliminated. The dose of supplementary seeds is somewhat empiric. A residual mass of cancer 1 cm. in diameter within a heavily irradiated pharynx should obviously not require the same additional tissue dose as if no external irradiation had already been given; but on the other hand many of these residual masses, although only a fraction of the original tumor, are much more radioresistant than the original tumor appeared to be at the beginning. One must not be too sanguine, therefore, in the hope that such masses will disappear under very small supplementary doses. In the average case the strength of the individual seeds should be between 1.0 and 2.0 mc., and they should be geometrically distributed throughout the residual mass, spaced about 1 cm. apart. Since the requirements in individual cases are obviously so variable, it is impossible to give more accurate recommendations for this type of therapy, but some estimate may be made from a review of the dosage in the present series.

The method of treatment most often successful (22 per cent cure rate) was external radiation alone with portals from 7 to 9 cm. in diameter, the dose varying between 2,000 r times 2 and 4,200 r times 2, and averaging about 3,600 r times 2. This observation must not be misinterpreted, however, for these were the more radiosensitive lesions which promptly cleared under the external radiation so that interstitial radiation was not considered necessary. *X*-radiation and supplementary seeds were used in sixty-one of the determinate cases, with a cure rate of 11 per cent. Superficially considered, such treatment might appear much less successful than that first mentioned, except for the fact that these growths were actually among the more radioresistant and bulky lesions which did not completely regress under the average dose of external radiation. All advanced cases with widespread nodes were treated by this method, thereby bringing down the percentage of cures. The average dose of external readiation in these cases was higher (between 3,500 and 4,500 r times 2), and the doses of seeds into the tonsil in the successful cases ranged between 10 and 16 mc. The radium element pack was used as the source of external radiation in a few cases, the dose ranging from 80,000 to 120,000 mghrs. times 2 with portals 7 cm. in diameter, a R.S.D. (radium skin distance) of 10 cm., and a filter of 2.5 mm. brass (equivalent). In most of these cases there was a supplementary dose

of radon seeds varying between 10 and 20 mc. Radon seeds alone were successful in two instances of smaller lesions treated by fairly heavy dosage, about 15 mc. each in two cases and 31 mc. in one case.

Treatment of Minor Salivary Gland Tumors of the Tonsillar Pillars. Mixed tumors and adenocarcinomas histologically resembling those of the parotid gland and submaxillary salivary glands not uncommonly arise in the minor salivary glands of the oral and pharyngeal mucous membranes. It is well known that these tumors are most common in the hard and soft palate and rare in the tonsillar pillars or tonsillar fossae. There are several such instances on record at the Memorial Hospital, although none occurred in the present series. They usually develop as globose or ovoid tumors which tend to remain encapsulated or sharply delimited until they have reached a size of several centimeters. Those which histologically resemble mixed tumors are essentially benign. The more cellular adenocarcinomas, although encapsulated at first, may metastasize widely to bones and viscera, often skipping the cervical lymph nodes. When occurring in the tonsillar region, these tumors are usually several centimeters in diameter, seldom ulcerated, with a history of several months or even years with very slight symptoms. The painless rounded swelling in the tonsillar region often suggests low grade peritonsillar abscesses anatomically, and these lesions are often incised for purposes of drainage.

Practically all of these minor salivary gland tumors are highly radioresistant from the anatomical standpoint and can be safely enucleated, preferably by cautery and blunt dissection. There are two such successful cases in the records of our clinic, but none occurred in this series. Preliminary ligation of the external carotid artery should be done if the tumors are large and deeply seated. One case at the Memorial Hospital was treated by massive doses of interstitial radon sufficient to produce rather widespread radionecrosis. The patient recovered and has remained well for more than ten years. It is obvious that such treatment by caustic doses of radiation is not justified if these tumors can be enucleated.

Treatment of Cervical Metastases. As has been previously mentioned, metastatic cervical nodes were clinically demonstrable on admission in 76 per cent of the present series. It is obvious, therefore, that no plan of treatment for cancer of the tonsil is adequate which does not provide for the management of this complication as well as the primary lesion. As has been previously stated, it is fortunate that

the most frequently involved node, and often the only one in this disease—the subdigastric—lies only a little below the level of the primary lesion, so that both can be irradiated by the same beam of

TABLE II

MILLICURIES IN GOLD SEEDS REQUIRED TO DELIVER SPECIFIED DOSES TO MASSES OF VARIOUS DIAMETERS

Skin Erythema Doses	Diameter of Mass—Centimeters											
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	6.0	7.0	8.0
	Number of Millicuries											
5	1.0	2.5	4.0	7.5	10	12	14	17	20	27	35	45
6	1.2	3.0	4.8	9.0	12	14	17	20	24	32	42	54
7	1.4	3.5	5.6	10	14	17	20	24	28	38	49	63
8	1.6	4.0	6.4	12	16	19	23	27	32	43	56	72
9	1.8	4.5	7.2	14	18	22	26	31	36	49	63	81
10	2.0	5.0	8.0	15	20	24	29	34	40	54	70	90
11	2.2	5.5	8.8	17	22	26	32	37	44	59	77	99
12	2.4	6.0	9.6	18	24	29	35	41	48	65	84	108

x-radiation. In our series, in about 40 per cent of those patients who had clinical metastases on admission, the nodes were limited to this area. Were it not for this fact, the cure rate in tonsillar cancer would be even lower than it is at present.

Under the above mentioned plan, the external irradiation of the most frequent metastases and of the primary lesion is carried out simultaneously and through the same portal. A decision as to the necessity for supplementary seeds in the cervical nodes and in the primary lesion should be made on the completion of a submaximal dose. In most cases it will be found that cervical metastases will not regress completely under average or even under large doses of external radiation, and supplementary seeds are indicated for the involved lymph nodes more often than for the primary lesion. The seeds may be inserted either through puncture wounds in the skin or after cervical exposure of the outer surface of the node. The dosage is somewhat empiric and depends both upon the size of the residual node and upon the amount of external radiation previously given. A tissue dose of 5 to 6 S.E.D. (as calculated from Table II) should be sufficient as a supplementary dose, but 8 to 10 S.E.D. should be used if seeds alone are employed without preliminary *x*-radiation. The successful doses in the present series after external radiation ranged between 9 and 22 mc. In the present series eight patients with histologically positive nodes (proved by aspiration biopsy) remained free of disease for a full five-year period after irradiation therapy. It would be misleading to compare the percentage of successful results obtained

by radiation treatment of metastatic cervical nodes in this series with those obtained by surgery, since it is obvious that those treated by radiation included the less favorable and advanced cases, while those treated by surgery were selected cases and limited to those patients who developed metastases only after complete control of the primary lesion by irradiation.

In the treatment of tonsillar cancer, if a metastatic node lies below the upper deep cervical region, it may in some instances be permissible to use a large portal to include the primary lesion and one or more scattered nodes. In the average case, however, we believe it best to treat widely separated nodes by individual portals 3.5 to 5 cm. in diameter, the size of each being just large enough to include amply the individual node. Treatments may be given on alternate days for a total dose of 7,000 to 8,000 r to each node through such small portals, and after about three weeks a supplementary dose of radon seeds implanted.

In tonsillar cancer, neck dissection is of little practical value in the treatment of cervical metastases which are present at the time of admission. It is obvious that neck dissection cannot be carried out safely in conjunction with adequate irradiation of the primary lesion. Neck dissection is occasionally indicated in large metastases occurring some months after healing of the primary lesion. The choice between neck dissection and radiation in such cases depends upon the judgment, experience and ability of the individual surgeon with the two methods and the equipment available. In the present series, five patients in whom metastases developed several months after the treatment of the primary lesion were treated by neck dissections. In three, the excised nodes were found to be histologically positive, and of these one remained well for a period of five years.

COMPLICATIONS

Heavy protracted irradiation through large portals to any part of the body is always followed by a chronic radiation sickness. When large fields are used over the neck or cheeks, such an effect is one of the most serious complications, and it may occur in the absence of any intense local tissue reaction such as skin blistering. The patient becomes listless, weak, toxic, loses weight and becomes cachectic. These symptoms are not due entirely to the local discomfort, dysphagia or reactions in the skin or mucous membranes, but probably arise in part as the result of toxic absorption from the large volume of

tissue irradiated as well as from the partial derangement in the function of the various vascular, glandular and nerve structures of the neck. Many cancer patients who receive heavy irradiation therapy undoubtedly die more from the effects or radiation than from the disease itself. Such systemic effects of radiation can be largely prevented by avoiding unnecessarily large portals. In pharyngeal cancer the portals seldom need be more than 7 or 8 cm. in diameter, and with such portals the local intensity may usually be safely increased so as to reach a cancer lethal dose. The use of portals 12 to 14 cm. in diameter or larger in the pharynx, whether or not required by the extent of the disease, is always indicative of an unfavorable prognosis.

The Acute Effect in the Skin and Mucous Membranes. The skin of the neck and the mucous membranes of the pharynx, which are directly exposed under the beam of radiation, should in all cases show an acute blistering or epidermicidal reaction within the first month of treatment. This degree of reaction is usually necessary if roentgen radiation is to produce a lethal effect on a tonsillar tumor. The depth of the cutaneous reaction may seem alarming in appearance, but one may be assured that such a reaction produced by repeated *x*-ray treatments over a period of fifteen to thirty days always heals under proper care without any serious sequelae. Under fractionated *x*-radiation by the technic already described, the typical reaction begins after about a week with a mild erythema which becomes deeper but remains dry and sometimes slightly pigmented during the second week. About the fifteenth to twentieth day, the superficial or epidermal layers of the skin become slightly raised by serum, and the corium, being denuded (at first over only scattered areas), becomes a deep red weeping raw surface which bleeds on slight trauma. After a few days the entire area of skin exposed to the direct beam may be denuded of epidermis. While the skin is in a dry state, frequent applications of petrolatum or liquid petrolatum should be used with no other dressing. When the surface is denuded, it should be kept covered with a single layer of fine mesh gauze bandage impregnated with petrolatum, boric acid ointment or the following hydroscopic ointment:

	Parts
Hydrous wool fat	2
Zinc oxide	1
Starch	1
Liquid petrolatum sufficient to make a soft paste	

The raw surface should be sponged daily with sterile saline solution to remove the exudate, and the surrounding normal skin should be cleansed with soap and water and alcohol. If the raw surface is protected from dryness, crusting, trauma and secondary infection, it ordinarily heals completely in from ten to fourteen days, leaving a soft pliable skin in which moderate telangiectasis may or may not later appear.

The mucosal reaction, a counterpart of that in the skin, should go on to a membranous mucositis of diphtheritic appearance in the tissues exposed to the direct beam. Although not painful while the part is at rest, this lesion is tender on movement and bleeds slightly but easily if the membrane is disturbed. It reaches its maximum in about twenty or thirty days after the beginning of treatment and usually disappears in ten or fifteen days, its duration depending on the size of the total dose. When radon seeds are used to supplement the external radiation, this type of reaction becomes more acute in the neighborhood of the implantation. During its height there is considerable serous and mucoid discharge from the surface, with a diminution in the quantity and an increase in the viscosity of the saliva. If the condition is not relieved, the accumulation of these secretions is the cause of a great deal of discomfort.

As a matter of routine at the beginning of treatment, irrigations of the throat should be given every two hours with an irrigating can equipped with a rubber tube and glass nozzle. A warm solution of sodium bicarbonate and water should be used. The patient is instructed to take the irrigation at night if he wakens and notes marked discomfort. This single procedure affords considerable relief, as is proved by the fact that it is voluntarily continued by the majority of patients without further urging. The viscidity of the secretions is greatly relieved as soon as the mucositis clears, but dryness of the mucous membranes may persist in a lessening degree for several years after treatment, a complication which will be discussed under "Xerostomia." The reaction of the mucous membrane is partly responsible for the dysphagia which sometimes occurs.

Dysphagia. This complication is always present to some extent when an acute radiation reaction is produced in the pharynx. Even though the disability is only moderate, it still may be responsible for a marked loss of weight and strength in a nonco-operative patient. The patient should be instructed as to the necessity for maintaining his weight and nutrition, and should be encouraged to take an

adequate balanced liquid diet of high caloric value. If necessary, a rubber feeding tube (No. 16 French urethral catheter) may be inserted through the nasal cavity down into the esophagus and left for a period of several days during the height of the reaction. We have found that most cancer patients who must subsist on even the most intelligently prepared liquid diets are benefited by supplementary liver and vitamins (especially B and C). One teaspoonful of liver extract powder may be given two to three times daily or two to three heaping tablespoonfuls daily of dried yeast may be dissolved in the liquid feeding. Fresh fruit juices supply vitamin C.

Pain. As we have previously mentioned, pain is one of the earliest symptoms in cancer of the tonsil. If the disease is uncontrolled or if radionecrosis and local sepsis occur, the pain in the local area may eventually radiate to the ear or to the whole side of the head. When these complications are also associated with uncontrolled, deeply infiltrating cervical metastases, the continual intractable pain may be so severe as to be a cause of death from exhaustion. Neurolysis by alcohol is not suitable in this area since not only is the fifth cranial nerve involved, but also the seventh and ninth and often the upper cervical sensory roots. Localized pain on admission due to sepsis and to pressure by the growth in the tonsil is often partly relieved by hot throat irrigations and tends also to diminish as the tumor regresses under radiation therapy. Late radionecrosis is almost always associated with pain radiating to the ear over the chorda tympani. Since in all intraoral cancer the pain is apt to continue for several weeks before complete relief is obtained, attempts should always be made in the beginning to obtain relief by such milder sedatives as codeine in doses of ½ gr. (30 mg.) and acetyl salicylic acid 10 gr. (600 mg.) given every six to twelve hours, increasing the number of daily doses at first and finally increasing dose to 1 gr. (60 mg.) of codeine if necessary after two to three weeks when the patient becomes accustomed to the drug. Morphine should be reserved for the advanced stages or for acute transitory conditions since, once established, the morphine habit can be broken only with difficulty and is often the cause of more suffering than the cancer itself.

Radionecrosis and Osteomyelitis. There is a widespread erroneous belief that radionecrosis depends entirely upon the intensity and quality of the radiation. As we[296] have previously pointed out, radionecrosis at a depth never occurs except when infection is introduced,

no matter how heavy the radiation dose. If a mass of tissue at a depth is completely devitalized by irradiation (or by any other physical agent) and no local infection occurs, the devitalized mass will be absorbed or replaced by fibrous tissue or will calcify and be tolerated locally as any form of sterile foreign body. If infection is introduced, the phenomenon generally known as radionecrosis occurs, and the devitalized mass suppurates and must be completely extruded before healing can take place.

Since infection is always present on the surface of the skin or mucous membranes, superficial radionecrosis occurs in superficial growths with greater frequency than with those at a depth. In the tonsillar area, infection is always present in ulcerated tumors and may also be present in the depths of the tonsillar crypts, so that the conditions favorable to slough are unusually frequent. Radionecrosis may occur after heavy external radiation alone, but the incidence is increased by the use of interstitial radon both because of the possibility of too great concentration of the radiation effect and because infection may be introduced during the insertion of the seeds. A small volume of radionecrosis in the upper part of the pharynx or oral cavity is compatible with an excellent end result. The greater the volume of the slough, the greater the chance of erosion of such vital structures as blood vessels.

When the soft tissues have been eroded by necrosis, heavily irradiated bone of the mandible may be exposed and osteomyelitis results, a complication which occurred in seven of our patients, one of whom required a partial resection of one ramus of the mandible. Of these seven patients, three remained alive and well for five years.

In treating this complication, the slough should be gently manipulated every day, the loosened portion removed and the more adherent clipped away with scissors. No aggressive attempt should be made to clear out all necrotic tissue. In these cases, careful attention to oral hygiene by irrigations and gargles is particularly important.

Practically all necrotic lesions of the oral cavity are produced by anaerobic saprophytic organisms for which oxygenic applications are specific. The average preparations, such as sodium perborate and hydrogen peroxide, are too transient in their action, but the use of zinc peroxide (marketed under the name "Z. P. O.") as recently introduced by Meleney[35] will often clear the offensive odor and improve the appearance of the ulcer within a few hours. Sunderland

and Binkley[50] have recently reported upon the use of this substance for necrotic intraoral cancer in our clinic. In brief, the necrotic cavity is packed once or twice daily with gauze saturated by a suspension of zinc peroxide in water.

In the present series, radionecrosis or slough appeared as a complication in twenty-nine cases (20 per cent), and 14 per cent of these patients recovered and remained free of disease for five years, a figure only a little below the average cure rate (18 per cent). This complication does not appear to have been absolutely determined by the size of the radiation dose, either in *x*-radiation or in seeds. It occurred in one instance after a dose of only 3 mc. in seeds and was absent in another instance after 50 mc. in seeds supplementary to 80,000 mghrs. times 2 to the neck with the element pack. One of the most serious concomitants of radionecrosis is hemorrhage.

Hemorrhage. The blood supply of the tonsil arises from several sources: the tonsillar and the ascending palatine branches of the external maxillary artery, the dorsalis linguae branch of the lingual artery, the descending palatine branch of the internal maxillary artery and the ascending pharyngeal branch of the external carotid. Most of these vessels anastomose freely in the tonsillar fossa. The largest and most important from the standpoint of hemorrhage is the tonsillar branch of the external maxillary (facial) artery, which passes upward between the internal pterygoid and the styloglossus and pierces the superior constrictor to enter the tonsil on its lateral surface.

Hemorrhage is most likely to occur when there is deep slough which approaches the lateral surface of the tonsil, and immediate bleeding is ordinarily readily controlled by digital tamponage until arrangements can be made (within a few hours) to ligate the external carotid artery and its lingual and facial branches. The first hemorrhage is seldom fatal, but when the necrosis has become so deep and extensive as to cause even moderate bleeding, the erosion of several adjacent vessels, such as the internal carotid or the jugular vein, may soon occur so that the eventual prognosis is grave. In the present series, hemorrhage occurred in sixteen cases, in seven of which the loss of blood was considered sufficiently severe to require ligation of the external carotid and its branches. In all seven of the latter cases, subsequent hemorrhages occurred from other vessels following these ligations, and all cases eventually terminated fatally. Obviously the deaths in these cases were not due to the effects of the ligation of the

external carotid, for it is a well known fact that ligation of one or even of both of these arteries is not a serious procedure.

Edema of the Hypopharynx. This complication should seldom occur after proper radiation treatment of tonsillar cancer except when metastases are widespread through the neck so as to necessitate the use of portals 12 to 15 cm. in diameter. As we have previously mentioned, the use of such large portals, whether necessary or not, is always indicative of a poor prognosis. The occurrence of edema in the hypopharynx following irradiation treatment of tonsillar cancer with nodes limited to the upper deep cervical region should be a reproach to the radiologist who has given the treatment. In the present series, edema of the hypopharynx occurred in some of the earlier cases when we did not appreciate the disadvantages of large portals. In the more recent cases, it has occurred only when large or multiple portals were necessary because of widespread metastases extending to the lower portion of the neck.

Xerostomia. The palatine tonsil lies under the anterior edge of the parotid salivary gland in the horizontal coronal plane. A portal even as small as 7 cm. in diameter will, therefore, include the greater part of the parotid salivary gland as well as a portion of the submaxillary salivary gland. When cancer lethal doses are administered to this area, the secretory function of these glands is markedly diminished. The mucous membrane of the upper portion of the pharynx contains numerous minor salivary and mucous glands which, with the saliva, serve to moisten and lubricate the mucous membranes of the oral cavity and pharynx. For these reasons, adequate radiation therapy of tonsillar cancer is always followed by some degree of xerostomia. The saliva decreases in quantity and its viscidity is increased. In such cases, inspection will reveal that the soft palate and pharyngeal walls are rather dry and glistening. Although this complication cannot be entirely avoided, its degree can be markedly reduced by the use of mouth washes and by frequent sips of liquid petrolatum which the patient may carry in his pocket in a small bottle. Chewing gum or holding a lozenge in the mouth seems to stimulate the flow of saliva and to distribute it more widely in some instances. After a year or two, the secretions tend to become more normal although complete function is never entirely restored.

Recurrence. Following treatment by radiation, even though there is apparent complete regression and healing of the primary lesion, local recurrence may take place within a month or even after

TABLE III

FACTORS INFLUENCING THE PROGNOSIS IN 148 CASES (DETERMINATE GROUP) OF CANCER OF THE TONSIL

1931 to 1935, Inclusive

	Total Number of Cases	Number of Five-year Cures	Per Cent of Five-year Cures
Age in years:			
Below 40	16	2	13
41 to 50	20	5	25
51 to 60	41	6	15
Over 60	69	12	17
Not stated	2	1	
Sex:			
Males	125	20	16
Females	23	6	26
Size of lesion:			
1 cm. or less	2	0	0
1.1 to 2 cm	10	4	40
2.1 to 3 cm	46	7	15
3.1 to 4 cm	25	5	20
Over 4 cm	33	3	9
Not stated	32	7	22
Metastases (histologically proved):			
None at any time	34	13	38
None on admission	37	14	38
Present on admission	111	9	8
Developed after admission	3	1	33
Present some time	103	10	10
Histopathology: (primary)			
Squamous cell, grade I	4	1	25
Squamous cell, grade II	59	8	14
Squamous cell, grade III	19	2	11
Squamous cell, grade IV	1	0	0
Squamous cell, ungraded	9	4	44
Transitional cell grade II	2	1	50
Transitional cell grade III	7	3	43
Transitional cell grade IV	6	0	0
Lymphoepithelioma	7	1	14
Lymphosarcoma	20	4	20
Unclassified	14	2	14
Status of disease on admission:			
Residual, recurrent, and metastatic after treatment elsewhere to primary:			
After radiation	10	0	0
After surgery	12	2	16
After combination	4	1	25
After endothermy	4	1	25
	30	4	14
Primary cases, no treatment elsewhere	118	22	19

as long as a year. In the present series such recurrence appeared in twenty-four cases, the majority (fourteen cases) between the fourth and sixth month, although five occurred after one year. In this group there were no five-year survivals, although curative attempts were made in all cases by supplementary treatment—in a few cases by further *x*-radiation, but in the majority by additional implantation of radon seeds in the areas of recurrence. The chief reason for the bad prognosis in recurrent cancer of the tonsil undoubtedly lies in the fact that the local tissues of the pharynx and neck have already been so heavily irradiated that the tolerance to irradiation has been exhausted, and that further attempts are invariably followed by fatal complications or persistent cancer. Following heavy irradiation there is no such thing as complete recovery of the tissues from the standpoint of tolerance to subsequent radiation.

A clinical diagnosis of a recurrent or a persistent growth in the tonsillar area is readily confirmed by biopsy; but the diagnosis is much more difficult in suspected recurrent or persistent cervical metastatic cancer, since following heavy irradiation or surgery there may be indurated masses of scar tissue which cannot always be differentiated clinically from residual cancer except by the subsequent clinical course. In the present series, in at least twenty-four cases after apparent complete regression of the cervical lymph nodes there was recurrence or extension of the growth in the neck. Of these, two remained well for five years after subsequent treatment.

PROGNOSIS

Before the advent of radiation therapy, cancer of the palatine tonsil was considered practically a hopeless disease, and even with modern methods this opinion is still held by many writers. Ducuing,[14] in 1935, stated that except in very rare cases, treatment of malignant growths of the tonsil gives only palliative results of very short duration. While this viewpoint seems extreme, the prognosis is not as favorable as in most other anatomic forms of growth in the oral cavity or pharynx. The reasons for this are fairly obvious. Since the tactile sense in the tonsillar area is not acute, the primary lesion usually reaches a large size before it is detected by the patient. In the present series the average diameter was about 4 cm. on admission. In many other areas of the oral cavity and pharynx the lesions can be discovered much earlier. The advanced stage of the disease in the average case on admission is further indicated by the fact that three-

fourths of the present cases had metastases on admission. The histologic type of the growth is among the most malignant of the oral cavity and pharynx; and even if the primary lesion and cervical metastases are eventually cured, the patient is still under the hazard of generalized dissemination. A review of the older literature reveals an almost uniformly hopeless attitude toward this disease when treated by surgery; for example, Broders,[3] in 1927, stated that in his opinion no definite five-year cure had ever been obtained by surgery. Under radiation methods, the cure rate in the earlier cases is fairly satisfactory as compared to most forms of upper respiratory and alimentary tract cancer. The factors which influence the prognosis are given in Table III, the most significant of which will be discussed separately.

Age. The chance of cure appears to be best between the ages of forty and fifty. The relatively poor prognosis in those under forty (if not a coincidence) is probably due to the more malignant histologic type of growth in younger patients, and in those over the age of fifty to the inability of older patients to withstand the complications of treatment.

Sex. As in most forms of oral and pharyngeal cancer treated by radiation, the prognosis in females (26 per cent) is definitely better than in males (16 per cent). It is our opinion that such findings are due to the fact that cancer in the female is more radiosensitive than its anatomic and histologic counterpart in the male.

Size of the Lesion. As might be expected, the cure rate decreases as the size of the lesion increases. It is noteworthy that in the twelve cases of our series in which the lesion was 2 cm. or less in diameter, four (33 per cent) survived five years, a cure rate twice the average for the whole group.

Metastases. It is apparent that its capacity to metastatsize is the most significant factor in the malignancy of tonsillar cancer. When no metastases were present on admission or when none occurred at any time, the cure rate is almost 40 per cent. When metastases were present on admission, the cure rate is only 8 per cent.

Histopathology. From an analysis of our series it appears that the prognosis in cancer of the tonsil is better in transitional cell carcinoma and lymphosarcoma than in squamous carcinoma. Under radiation therapy this difference might be accounted for, at least in part, by the higher radiosensitivity of these groups. However, lymphoepithelioma which is as radiosensitive as the two above men-

tioned, gives the poorest prognosis of all (only about one-third of the two best groups). Such figures may be due in part to coincidence.

Status of the Disease on Admission. As might be expected, the cure rate in patients who had received no treatment before admission was better (19 per cent) than in those which had been treated elsewhere (14 per cent). Previous unsuccessful treatment by radiation or surgery does not preclude success, however, as is shown by an eventual salvage of four (14 per cent) of thirty recurrent cases.

END RESULTS

The net five-year cure rate in the present series calculated on 148 determinate cases is 18 per cent (Table IV). We have previously

TABLE IV

MEMORIAL HOSPITAL

FIVE-YEAR END-RESULTS IN CANCER OF THE TONSIL

1931 to 1935, Inclusive

This series consists of all patients with histologically proved cases of cancer of the tonsil, both early and advanced, admitted during the specified period. Only those patients are excluded who, for any reason, were unable to return for treatment, palliation and observation in the out-patient department, and those who were lost track of within the first month after no more than one or two visits (clinic shoppers).

Total number of cases		157
Indeterminate group:		
Dead as a result of other causes and without recurrence	7	
Lost track of without recurrence	2	
Total number of indeterminate results		9
Determinate group:		
Total number minus those of indeterminate group		148
Failures:		
Dead as a result of cancer	117	
Lost track of with disease (probably dead)	5	
Living with recurrence	0	
Total number of failures in treatment		122
Successful results:		
Free from disease after five years or more		26
Five-year end-results:		
Successful results divided by determinate group (26/148)		18%

published the method of calculation of end results which is now used at the Memorial Hospital. Briefly stated, the clinical material is

unselected; that is, all patients who apply at the clinic is all stages of the disease are accepted for treatment or palliation and are included for statistical analysis. The only cases excluded are those of patients who, on their own decision, do not return for treatment and are lost track of within the first month. At least a 90 per cent follow-up is insisted upon. In calculating the net end results, those cases are subtracted as being indeterminate when the patients are lost track of or die of other causes not connected with cancer or its treatment after at least a year's freedom from disease.

Duffy[15] has reported on two series of tonsillar cancer which comprise the cases on the Head and Neck Service at Memorial Hospital from 1920 to 1930, with cure rates about the same as in the present report. From a comparison of the percentage of metastases on admission (60 per cent) which he reports in these earlier cases, it appears that prior to 1930 there was some selection of patients, since in the present series the percentage of metastases on admission, 75 per cent, indicates a more advanced average stage of the disease.

There are few reports in the literature which are calculated upon unselected groups of histologically proved cases with a five-year survival period as the basis of cure. Unfortunately, even in the best reports the authors seldom state definitely that the cases are unselected and that none was excluded because of an advanced stage of the disease. Patterson,[40] in 1934, reported nine five-year survivals in forty-one proved cases of cancer of the tonsil treated by endothermy. Coutard,[11] in 1932, reported 18 per cent five-year cures in thirty-three cases. Mathey-Cornet[33] reported 15 per cent five-year cures in seventy-seven cases. None of these authors definitely states that the cases were unselected. Schreiner reports two five-year cures in fifty-one cases, or 4 per cent.

SUMMARY AND CONCLUSIONS

The series herein reported consists of 157 consecutive unselected cases of all patients with cancer of the tonsil, in all stages of the disease, admitted to Memorial Hospital during the years 1931 to 1935, inclusive. The etiology, clinical course, method of treatment, end results and prognosis are discussed in detail. The net five-year cure rate is 18 per cent.

REFERENCES

1. v. Bergman, E. System of Practical Surgery, Vol. 1. Translated by W. T. Bull. New York, 1904. Lea Brothers & Co.

2. BERVEN, E. G. E. Malignant tumors of the tonsil; clinical study with special reference to radiological treatment. *Acta radiol. Supp.* XI, 1, 1931.
BERVEN, E. G. E. Development of technique and results in treatment of tumors of oral and nasal cavities. *Am. J. Roentgenol.*, 28: 332, 1932.
3. BRODERS, A. Carcinoma of the mouth; types and degrees of malignancy. *Am. J. Roentgenol.*, 17: 90, 1927.
4. BURNAM, C. F. Diagnosis and treatment of malignant tonsil conditions. *Surg., Gynec. & Obst.*, 55: 633, 1932.
5. BUTLIN, H. T. The Operative Surgery of Malignant Disease. Philadelphia, 1887. P. Blakiston, Son & Co.
6. CANUYT, G. Le traitement du cancer de l'amygdale. *Ann. de l'mal. oreille et larynx*, 48: 724, 1929.
7. CHEEVER, D. W. Cancer of the tonsil; removal of the tumor by external incision. *Boston. M. & S. J.*, 99: 133, 1878.
8. CHRISTOFORIDIS, M. Ueber Tonsillartumoren und deren Behandlung mit Röntgenstrahlen. *Ztschr. f. Hals-, Nasen- u. Obrenh.*, 22: 554, 1929.
9. CITELLI, S. Sur l'existence de leucoplacie typique sur les amygdales et le cornet inferieur. *Abst. Presse med.*, 37: 1465, 1929.
10. COSTOLOW, W. E. Malignancy of the tonsil. *Am. J. Surg.*, 23: 528, 1934.
11. COUTARD, H. Roentgen therapy of epitheliomas of the tonsillar region, hypopharynx and larynx from 1920 to 1926. *Am. J. Roentgenol.*, 28: 313, 1932.
12. CUTLER, M. Radium dosage and technique in carcinoma of the tonsil, pharynx and larynx. *Am. J. Roentgenol.*, 33: 690, 1935.
13. DESPONS, J. Cancer de l'amygdale. *Rev. de Laryngol.*, 49: 305, 339, 1928.
14. DUCUING, J. and DUCUING, L. Les tumeurs malignes de l'amygdale palatine. *Ann. d'oto-laryng.*, 1: 20, 1935.
15. DUFFY, J. J. Carcinoma of the tonsil. *New York State J. M.*, 34: 865, 1934.
16. EGGERS, C. Practical management of malignancies of the tonsil. *Am. J. Surg.*, 30: 254, 1935.
17. EWING, J. Lymphoepithelioma. *Am. J. Path.*, 5: 99, 1929.
18. FIGI, F. A. The treatment of malignant tumors of the mouth and throat. *Am. J. Roentgenol.*, 23: 648, 1930.
19. HARMER, W. D. The relative value of radiotherapy in the treatment of cancer of the upper air passages. *Lancet*, 2: 1057, 1931.
20. JACOBSON, N. Contributions to the surgery of malignant disease of the prostate gland and of the tonsils. *Ann. Surg.*, 33: 269, 1901.
21. JANEWAY, H. H. Treatment of cancer by buried emanation. *Am. J. Roentgenol.*, 7: 92, 1920.
22. JUUL, J. Protracted fractionated roentgen treatment of malignant tumors ad modum Coutard. *Acta radiol.*, 17: 209, 1936.
23. KISFALUDY, P. Über die kombinierte Behandlung des Tonsillenkrebses. *Strahlentherapie*, 55: 429, 1936.
24. KOCHER. Ueber Radicalheilung des Krebses. *Deutsche Ztschr. f. Chir.*, 13: 134, 1880.
25. KRONLEIN. Über Pharynxcarcinom und Pharynxexstirpation. *Brüns Beitr. zur klin. Chir.*, 18: 61, 1897.
26. v. LANGENBECK, B. Über die Exstirpation des Pharynx. *Verhandl. der deutsch. Gesellsch. f. Chir.*, 8: 115, 1879.
27. LEVIE, B. Classification and treatment of malignant tumors of the tonsils. *Acta oto-laryng.*, 25: 403, 1937.
28. MALLET, L. Über die transkutane Curie-therapie der Tonsillenkrebse. *Strahlentherapie*, 53: 54, 1935.

29. *a.* MARTIN, H. E. Peroral x-radiation in the treatment of intraoral cancer. *Radiol.*, 28: 527, 1937.
b. MARTIN, H. E. and SUGARBAKER, E. L. Cancer of the floor of the mouth. *Surg., Gynec. & Obst.* In press.
c. MARTIN, H. E. and BLADY, J. V. Cancer of the nasopharynx. *Arch. Otolaryngol.* In press.
d. MARTIN, H. E. and ELLIS, E. B. Aspiration biopsy. *Surg., Gynec. & Obst.*, 59: 578, 1934.
30. MATHEWS, J. Malignant tumors of the tonsil. *Laryngoscope*, 22: 737, 1912.
31. MATTICK, W. L. Epithelioma of the tonsil; study of 162 cases. *New York State J. M.*, 39: 1412, 1939.
32. MCCOY, J. Surgical treatment of cancer of the tonsil, with a report of cases. *Laryngoscope*, 29: 422, 1919.
33. MATHEY-CORNAT, R. Les methodes actuelles d'irradiation des tumeurs malignes de l'amygdale et leurs resultats. *Paris med.*, 1: 237, 1938.
34. MAUREL, G. and WEILL, R. Indications et technique du traitement des cancers de l'amygdale. *J. de med. de Paris*, 56: 217, 1936.
35. MELENEY, F. L. Treatment of traumatic wounds with zinc peroxide. *New York State J. Med.*, 39: 2188, 1939.
36. MELLER, A. Zur Statistik der Schleimhautcarcinome des Mundes und Rachens. *Deutsche Ztschr. f. Chir.*, 84: 105, 1906.
37. MIKULICZ, J. Die seitliche Pharyngotomie behufs Exstirpation maligner Geschwülste der Tonsillargegend. *Deutsche med. Wchnschr.*, 12: 157, 1886.
38. NATHANSON, E. A. Cancer of the tonsils. *Arch. Clin. Cancer Res.*, 3: 181, 1927–1928.
39. NEW, G. B. and CHILDREY, J. H. Tumors of tonsil and pharynx. *Arch. Otolaryngol.*, 14: 699, 713, 1931.
40. PATTERSON, N. Use of the diathermy knife in malignant disease of the mouth, nose and pharynx. *Lancet*, 2: 633, 1934.
41. QUICK, D. Treatment of malignant neoplasms of the tonsils. *J. Radiol.*, 3: 173, 1922.
42. REGAUD, C. and CREMIEN, R. Sur la suppression definitive du tissue thymique par la röntgentherapie. *Compt. rend. Soc. de Biol.*, 72: 523, 1912.
43. RICHARDS, G. E. The radiological treatment of cancer: methods and results 1928–1935. III. Malignant lesions of the tonsil and its pillars. *Canad. M. A. J.*, 35: 385, 1936.
44. SCHALL, L. A. Carcinoma of the tonsil. *New England J. M.*, 211: 997, 1934.
45. SCHMINCKE, A. Über lymphoepitheliale Geschwülste. *Beitr. z. path. Anat. u. z. allg. Path.*, 68: 161, 1921.
46. SEDILLOT. Nouveau procede en extirpation de la langue. *Gaz. med. de Paris*, 12: 126, 1844.
47. SIMEONI, C. Sul trattamento fisico dei tumori maligni delle tonsille palatine. *Arch. ital. di otol.*, 43: 612, 1932.
48. SIMMONS, C. Cancer of the buccal mucosa. *Ann. Surg.*, 92: 681, 1930.
49. SUTTON, J. B. Tumors Innocent and Malignant. London, 1893. Cassell & Co.
50. SUNDERLAND, D. A. and BINKLEY, J. S. The use of zinc peroxide in necrotic tumors and radionecrosis. *Radiol.* In Press.
51. TROTTER, W. Operation for malignant tumor of the pharynx. *Brit. M. J.*, 16: 485, 1929.
52. USILTON, P. J. Personal communication to the authors.
53. WURTZ, W. J. M. Malignant disease of the nose and throat with special reference to cancer of the nasal fossae, nasopharynx and tonsil. *New York M. J.*, 113: 434, 1921.

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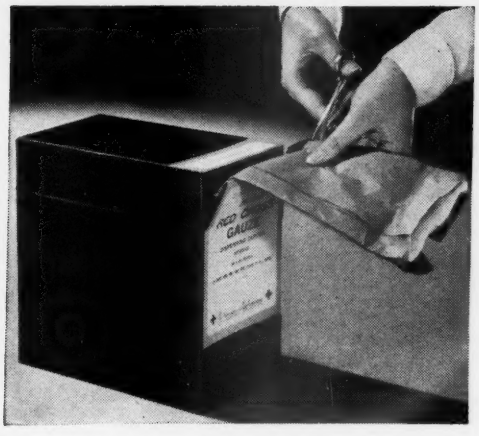

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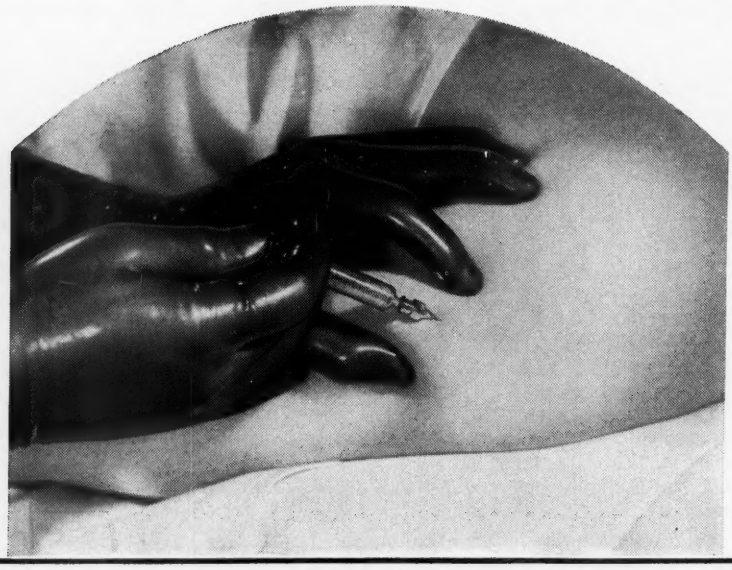

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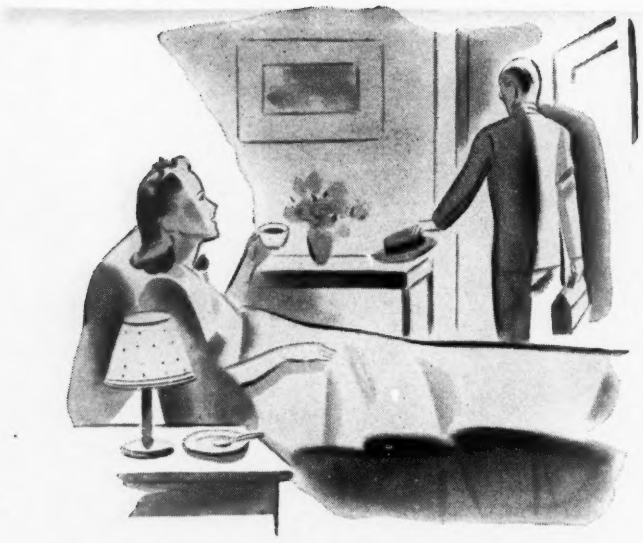

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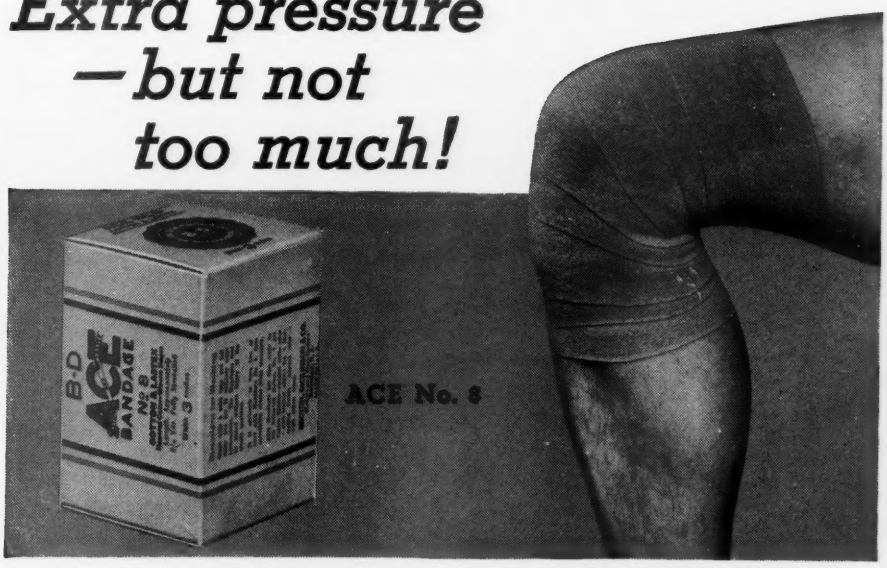

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AMERICAN ASSOCIATION FOR THE STUDY OF GOITER

Boston, May 26–28 1941. (Secretary—DR. W. BLAIR MOSSER, Kane, Penna.)

AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA

Seigniory Club, Montreal, Que., May 29–31, 1941. (Secretary—DR. RALPH G. CAROTHERS, 409 Broadway, Cincinnati)

AMERICAN ASSOCIATION OF GENITO-URINARY SURGEONS

Hot Springs, Va., May 29–31, 1941. (Secretary—DR. CHARLES C. HIGGINS, 2020 East 93rd Street, Cleveland)

AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS

Pittsburgh, May 5–9, 1941. (Secretary—MR. ARMOUR G. PARK, 540 N. Michigan Ave., Chicago)

AMERICAN ASSOCIATION OF OBSTETRICIANS, GYNECOLOGISTS AND ABDOMINAL SURGEONS

Hot Springs, Va., September 11–13, 1941. (Secretary—DR. JAMES R. BLOSS, 418—11th St., Huntington, W. Va.)

AMERICAN ASSOCIATION OF RAILWAY SURGEONS

Chicago, September 8–10, 1941. (Secretary—DR. R. B. KEPNER, 547 W. Jackson Blvd., Chicago)

AMERICAN COLLEGE OF SURGEONS

Boston, November 3–7, 1941. (Secretary—DR. FREDERIC A. BESLEY, 215 N. Sheridan Rd., Waukegan, Ill.)

AMERICAN CONGRESS OF PHYSICAL THERAPY

Washington, D. C., September 1–5, 1941. (Secretary—DR. RICHARD KOVACS, 2 East 88th Street, New York)

AMERICAN GYNECOLOGICAL SOCIETY

Colorado Springs, May 26–28, 1941. (Secretary—DR. RICHARD W. TELINDE, Johns Hopkins Hospital, Baltimore)

AMERICAN MEDICAL ASSOCIATION

Cleveland, June 2–6, 1941. (Secretary—DR. OLIN WEST, 535 N. Dearborn Street, Chicago)

AMERICAN ORTHOPAEDIC ASSOCIATION

Toronto, Can., 1941. (Secretary—DR. C. W. PEABODY, 474 Fisher Bldg., Detroit)

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Cleveland, June 1–3, 1941. (Secretary—DR. W. H. DANIEL 1930 Wilshire Blvd., Los Angeles

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White Sulphur Springs, W. Va., April 28–30, 1941. (Secretary—DR. CHARLES G. MIXTER, 319 Longwood Avenue, Boston)

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Louisville, Ky., October 29–November 1, 1941 (Secretary—COL. JAMES M. PHALEN, 1870 Wyoming Ave., N.W., Washington, D. C.)

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Honolulu, 1942. (Secretary—DR. FORREST J. PINKERTON, Young Bldg., Honolulu)

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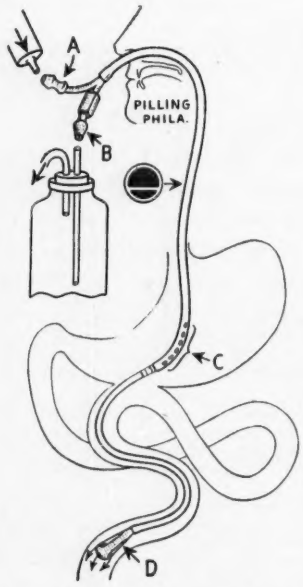

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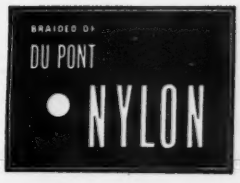

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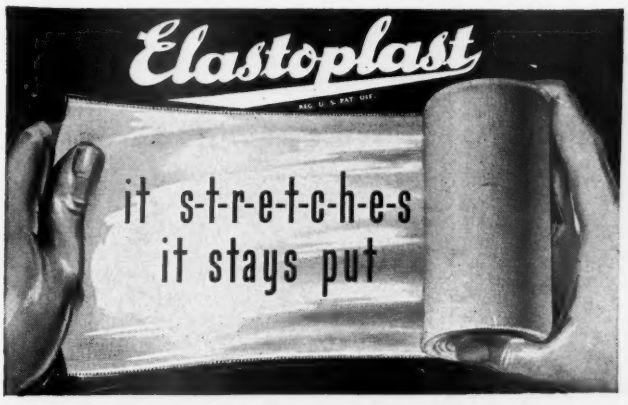

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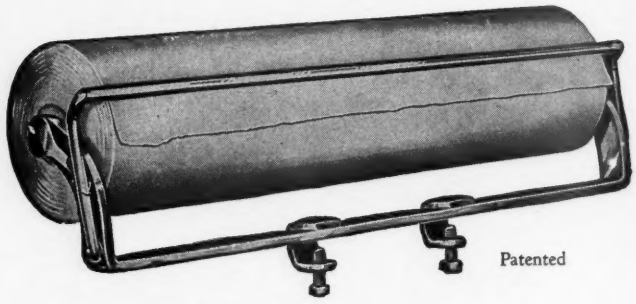

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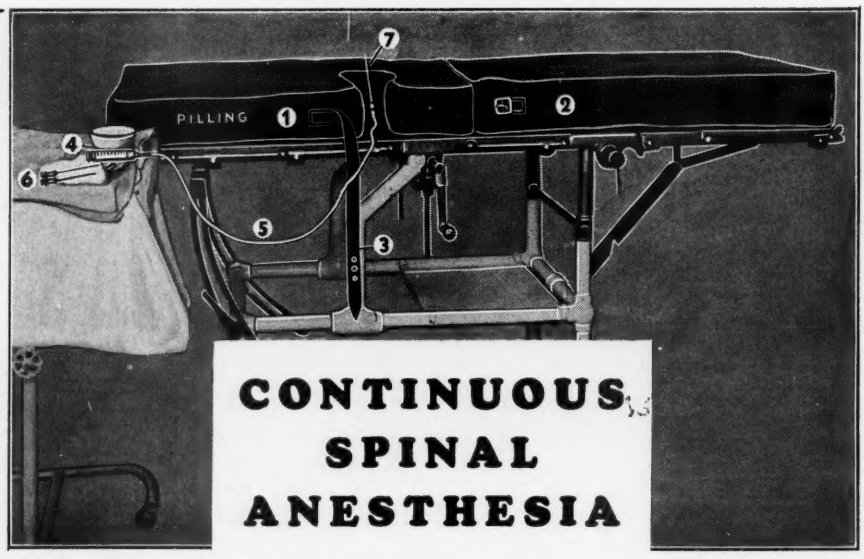

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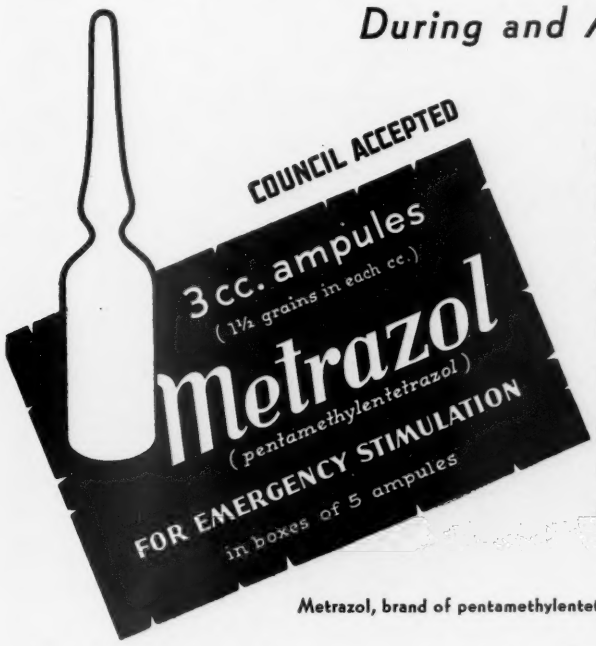

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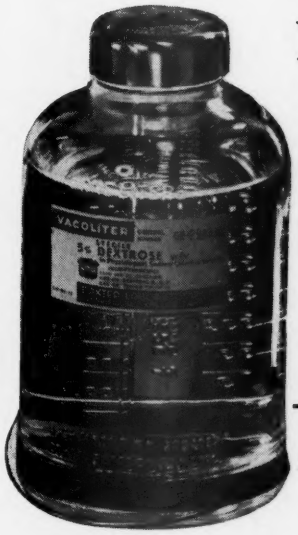

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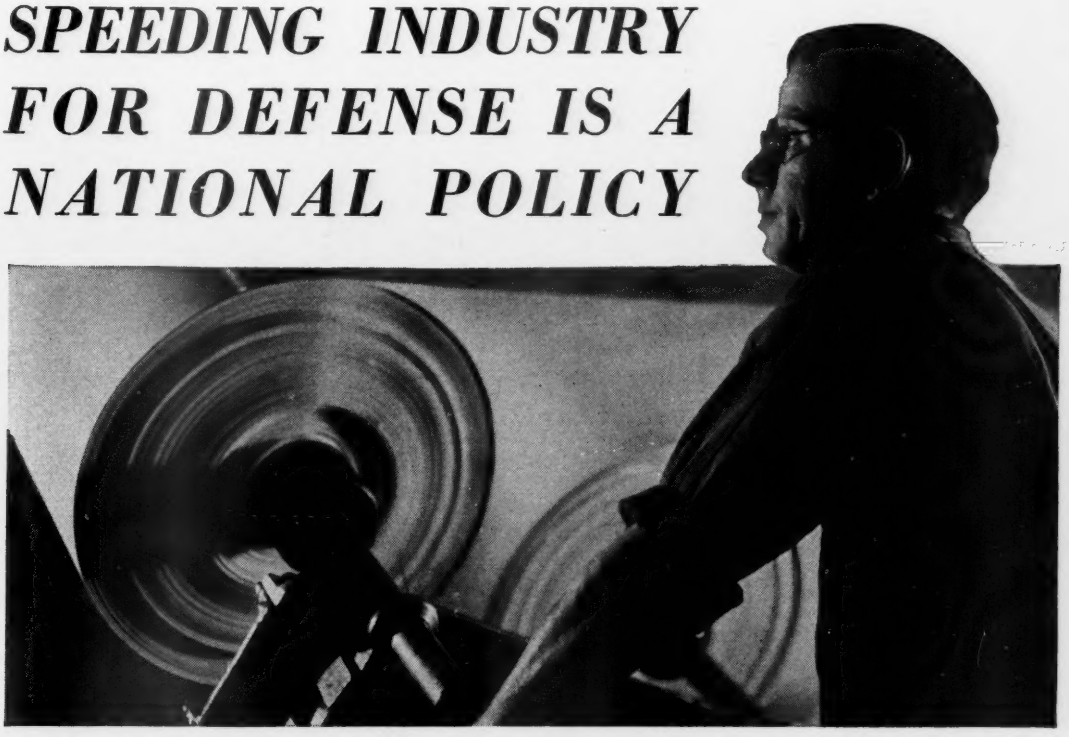

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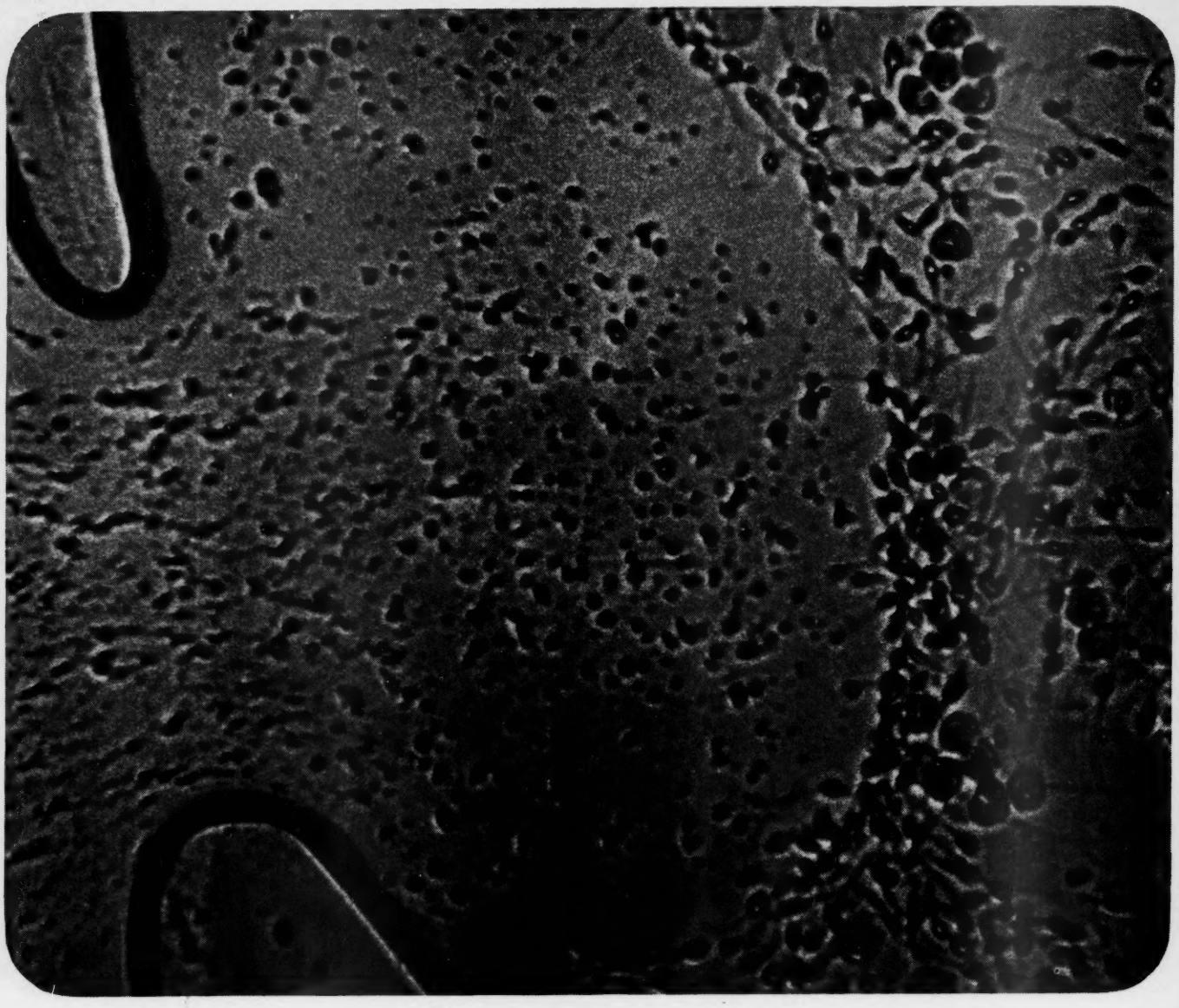

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• The spermicidal effect of Ortho-Gynol is clearly shown by this motion picture micro-photography. The above frame is from a section showing a field of Ortho-Gynol meeting a field of fresh human semen. The instantaneous spermicidal action is seen at the point of contact.

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The American Journal of Surgery

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